Enhancing methods for carbon stock estimation in tropical rainforests





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Scope

- Assessment of deforestation drivers in the tropics
- Quantitative projection of deforestation trends and associated uncertainties until 2050
- Estimation of reduction potentials of deforestation and associated uncertainties
- Proposals for determination of reference scenarios
- Proposals for ambitious reduction goals
- Consequences of including emission reduction from deforestation for the stability of the political climate regime

Umwelt Bundes Amt
Für Mensch und Umwelt
This project is supported by the German Federal Environment Agency

Motivation

- Land area changes are documented by remote sensing techniques with increasing precision
- Past CO_2 emission assessments were generally based on global datasets
- A step towards C assessments on national level is desired
- Forest situations and forest data quality differ greatly between tropical countries
  - Overall information on tropical forests is considered rather poor
  - Most reliable data commonly refer to aboveground biomass
- Currently, almost all non-Annex I parties are communicating at Tier 1 or lower level → Stepping up to Tier 2 level (IPCC) would improve C-pool assessments

MPI-BGC contribution

- Identification of drivers for deforestation in the tropics
- Development of methods for assessing:
  - Forest area change at national level
  - Forest carbon stocks at national level
- Capacity building at national institutions

- Identification of available, appropriate datasets
- Advice for strategic data enhancement (sampling schemes)
- Nationally viable methods for accounting of all C-pools (aboveground biomass, litter, soil, etc.)
  - Compliance with IPCC good practice guidelines
  - Tier 2 level

Achievements

- Identification of pilot countries on 3 continents
- Compilation of 321 plot based forest inventories ≥ 0.5 ha
  - Several of these plots have undergone soil sampling to meet IPCC Tier 2 criteria
- Inventory data are being evaluated and tested statistically







Available plot data

Received from:	International institutions	National institutions	NGOs	Researchers	Own	**Total**
PNG	0	94	0	0	0	**94**
Indonesia	2	0	0	2	12	**16**
Peru	2	14	8	159	14	**197**
Brazil	5	1	0	8	0	**14**
SE Asia	2	94	0	2	12	**110**
Amazonia	7	15	8	167	14	**211**

Available plot data

Identified with:	International institutions	National institutions	NGOs	Researchers	Own	**Total**
PNG	0	94	0	16	0	**110**
Indonesia	12	0	22	7	12	**53**
Peru	18	32	16	177	14	**257**
Brazil	13	12	0	25	0	**50**
SE Asia	12	94	22	23	12	**163**
Amazonia	31	44	16	202	14	**307**

Achievements

- Cooperation with the Papua New Guinea Forest Research Institute
- Capacity building in advanced soil sampling skills
- Joint development of representative soil carbon sampling scheme to be applied to their permanent sampling plots







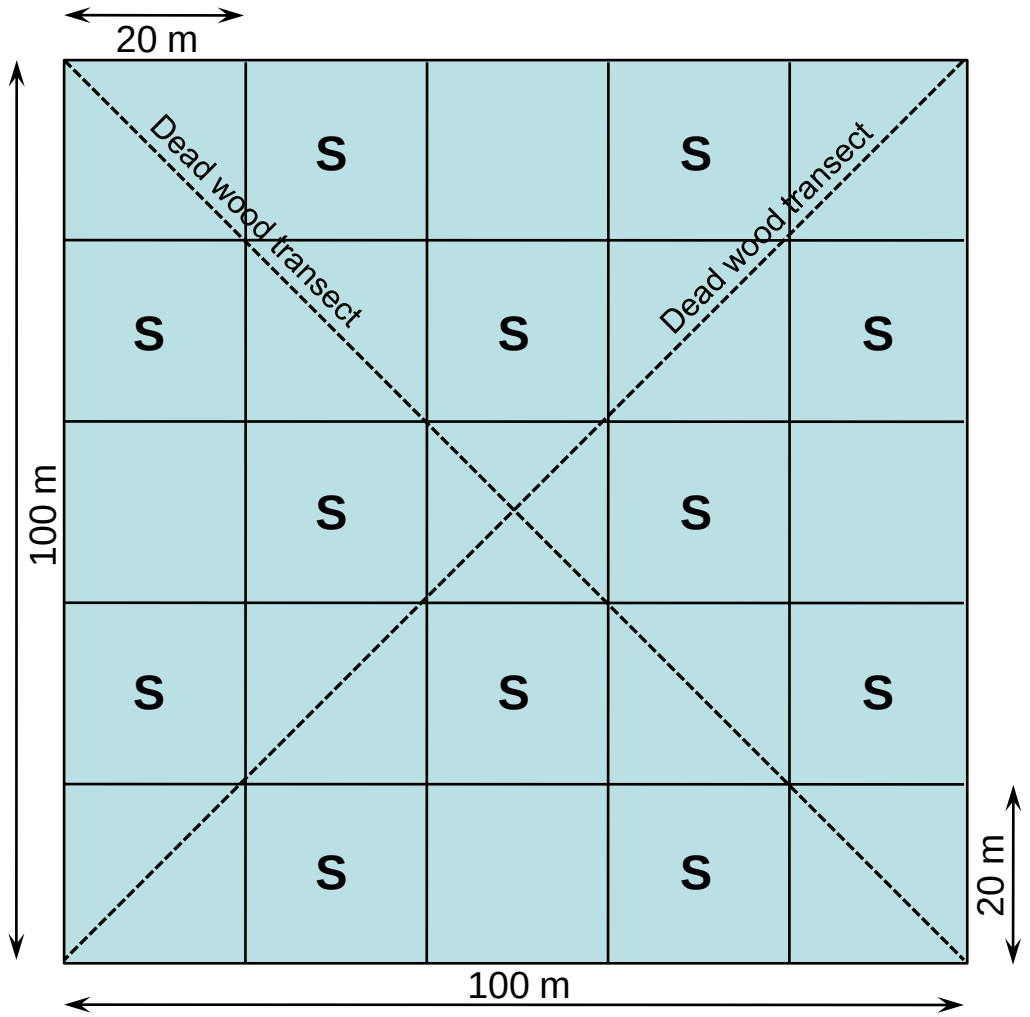
Case study

Papua New Guinea – in collaboration with FRI

- 94 permanent 1 ha sample plots maintained by FRI offer a wealth of information for the country

Plotno: WATUT03 **Location:** GUMI **Province:** Morobe Province **Date of measurement:** 07-08-95

Quadrat	Tree No.	Species name	POM	Diam	Basal Area	Stem Form	Crown			Height			BA Count
							Diam	Posn	Qual	Merch	CrBase	Total	
00	01	*Phyllocladus hypophyllus*	1.3	11.4	0.010	C	0.3	5	5	1.2	1.2	2.1	4
00	02	*Cryptocarya*	1.3	19.5	0.030	B	0.4	4	5	10.5	16.1	19.3	3
00	03	*Opocunonia*	1.3	35.5	0.099	C	0.6	5	5	16.6	21.6	27.9	4
00	04	*Lithocarpus*	1.3	25.2	0.050	B	0.8	4	5	15.0	18.4	26.1	5
02	01	*Schizomeria*	1.3	40.6	0.129	A	0.3	5	3	15.3	15.3	32.2	4
02	02	*Cryptocarya*	1.3	19.6	0.030	C	0.3	3	3	15.3	15.3	32.2	4
02	03	*Myristica*	1.5	33.1	0.086	A	0.3	4	4	15.3	15.3	29.8	7
02	04	*Aporusa*	1.5	12.4	0.012	C	0.2	4	4	4.2	11.7	18.7	8
...													


20 m
Dead wood transect
Dead wood transect
S
100 m
20 m
100 m

Case study

Papua New Guinea – in collaboration with FRI

- 94 permanent 1 ha sample plots maintained by FRI offer a wealth of information for the country
- Effects on aboveground C-stock estimation exemplified on:
  - Volume allometry
  - Wood density
- Management effect on aboveground biomass

Papua New Guinea

- Forest cover:
  76 %
  (34.6 million ha)

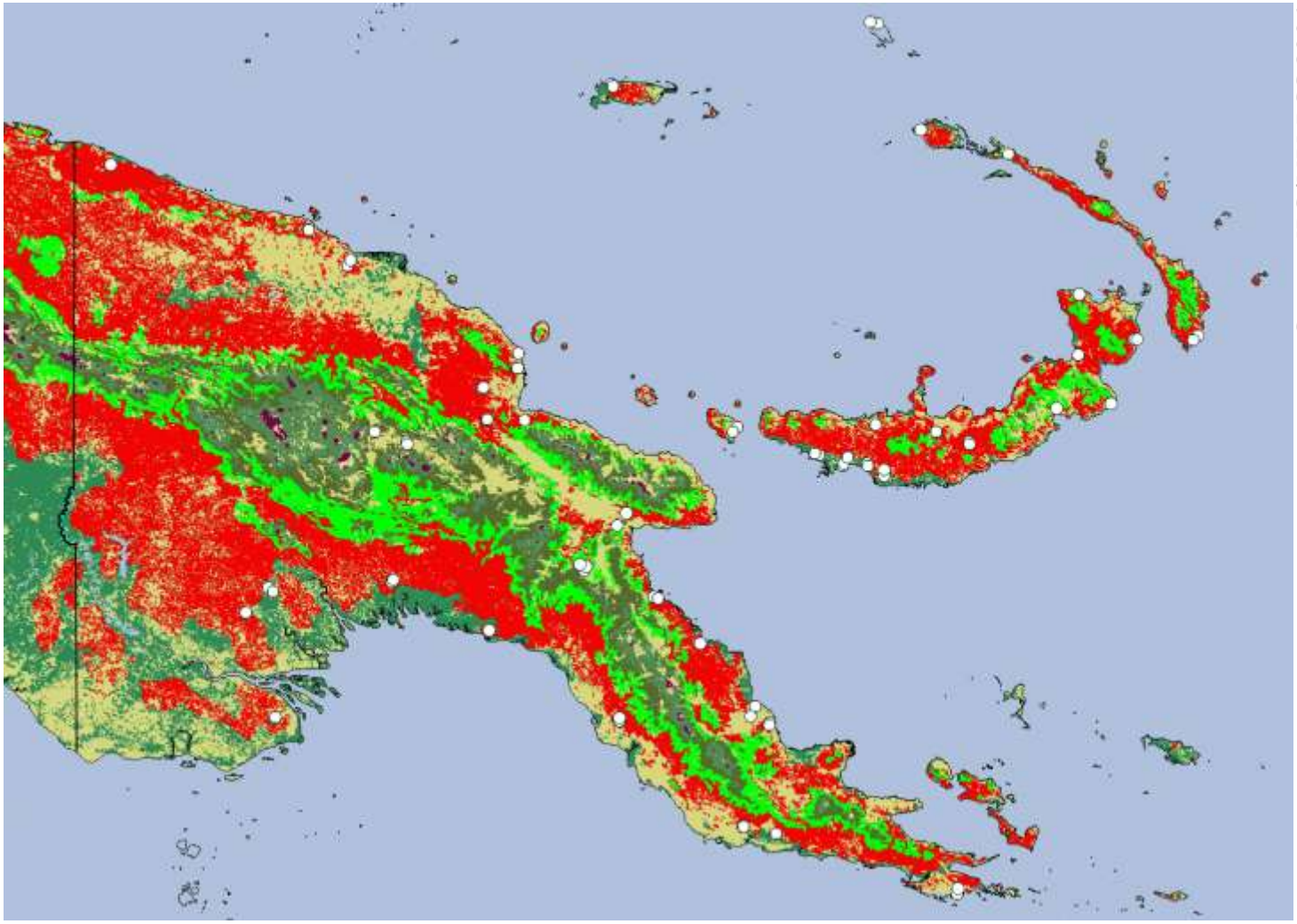
Source: FAO FRA 2005



Papua New Guinea

- Forest cover: **76 %** (34.6 million ha)
- Lowland RF: **58 %**
- **94 PSPs** active predominantly in lowlands

Source: FAO FRA 2005



Source: JRC/MPI-BGC 2006

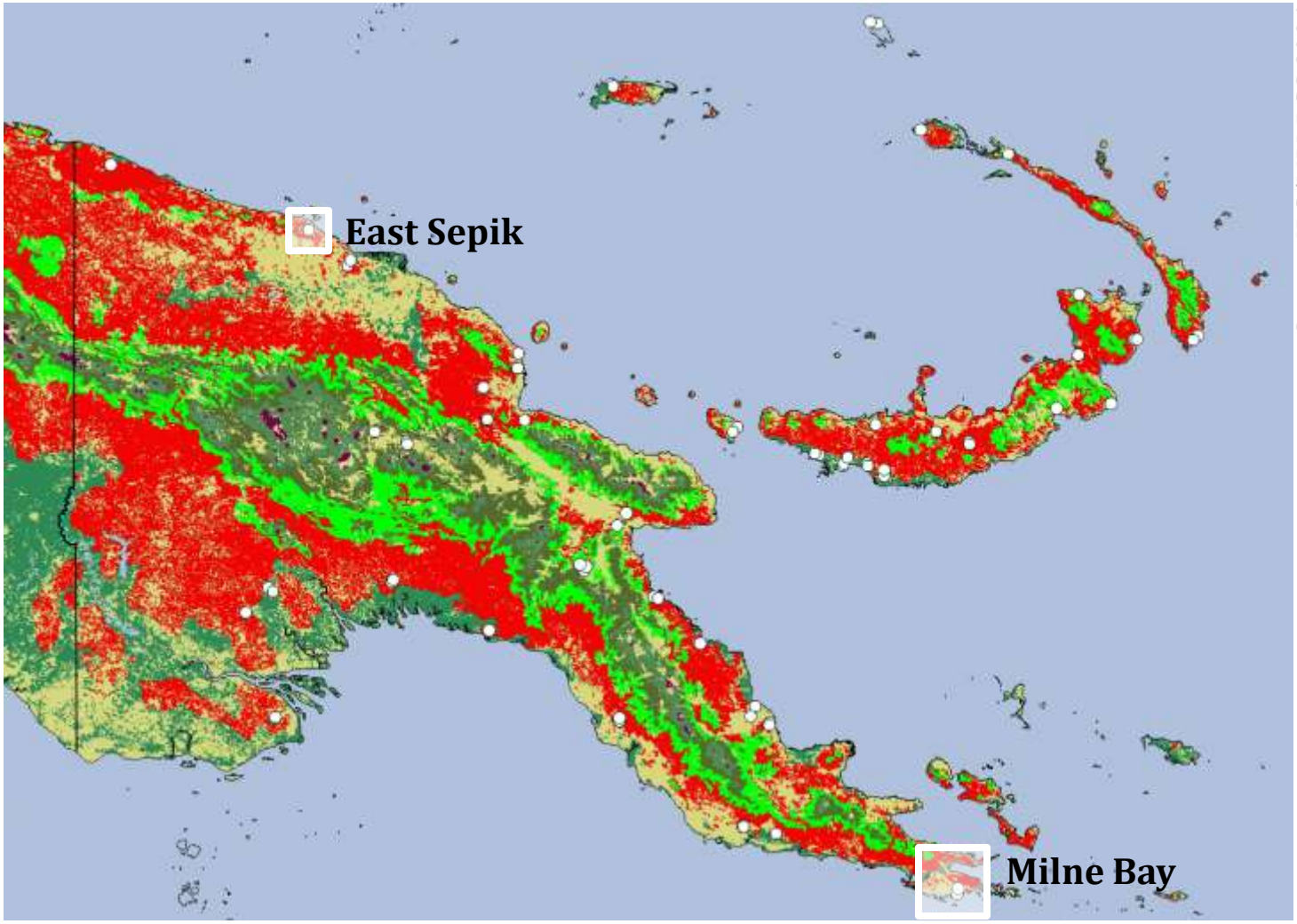
Lowland Rainforest

Permanent Sample Plot

Papua New Guinea

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Lowland Rainforest

Permanent Sample Plot

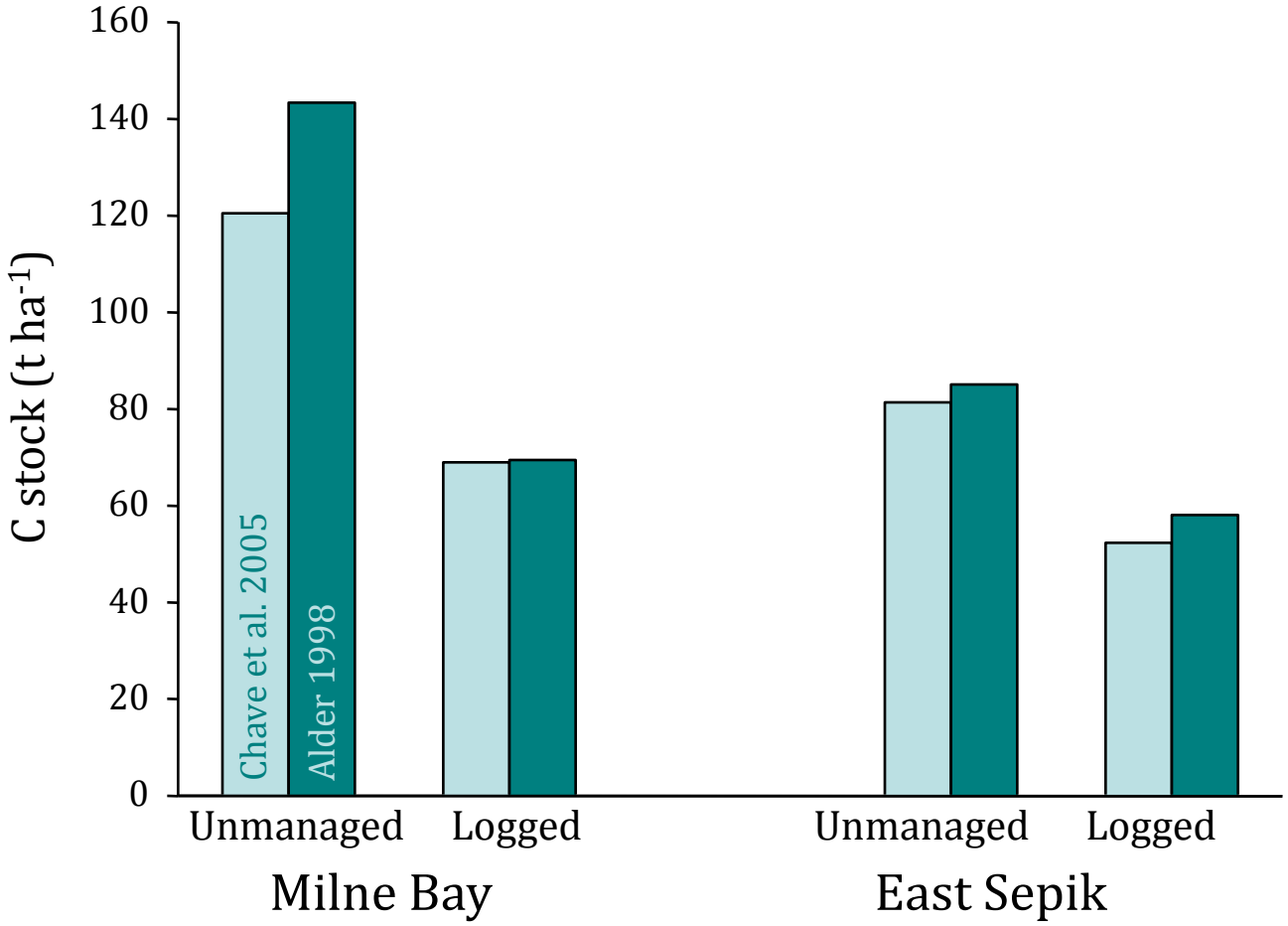
Papua New Guinea

Example plot characteristics

	Milne Bay			East Sepik		
	Unman-aged	Logged	Δ (%)	Unman-aged	Logged	Δ (%)
Basal area (m^2 ha^{-1})	33	20	-38	25	13	-47
Stem density (ha^{-1})	411	364	-11	514	254	-51
Upper height (m)	36	32	-10	32	37	16

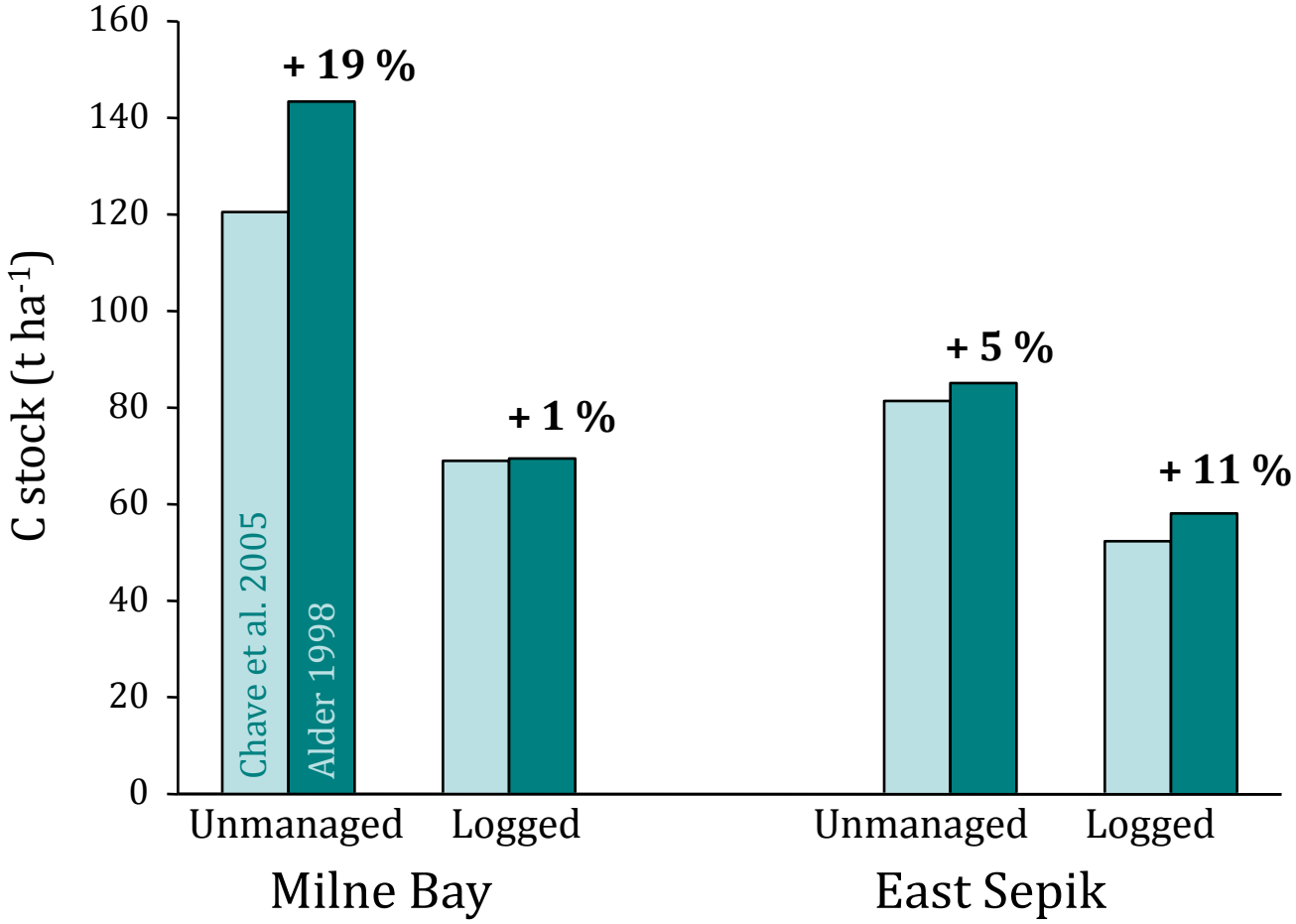
Papua New Guinea

Carbon stocks



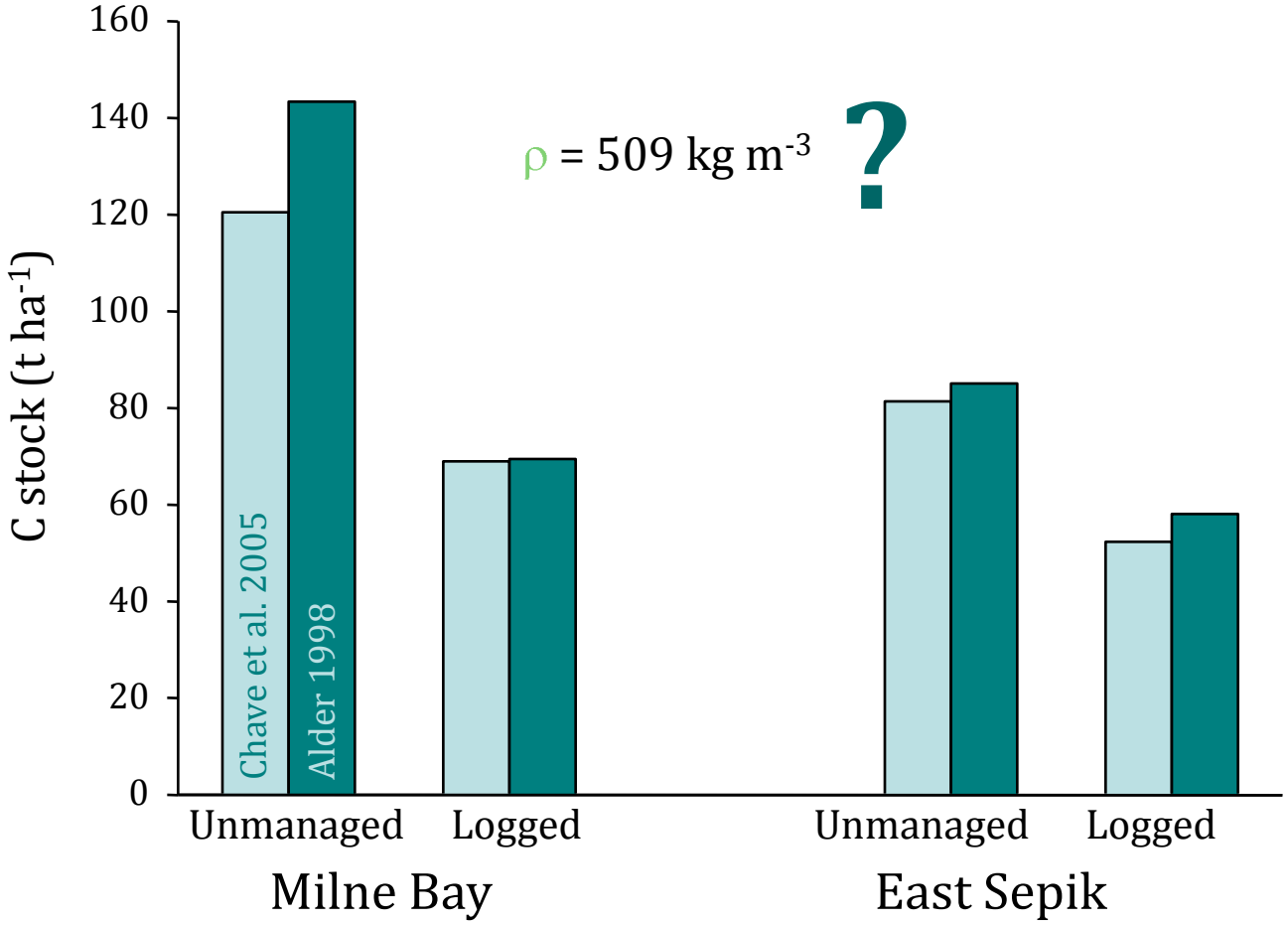
Papua New Guinea

Carbon stocks – allometry effect



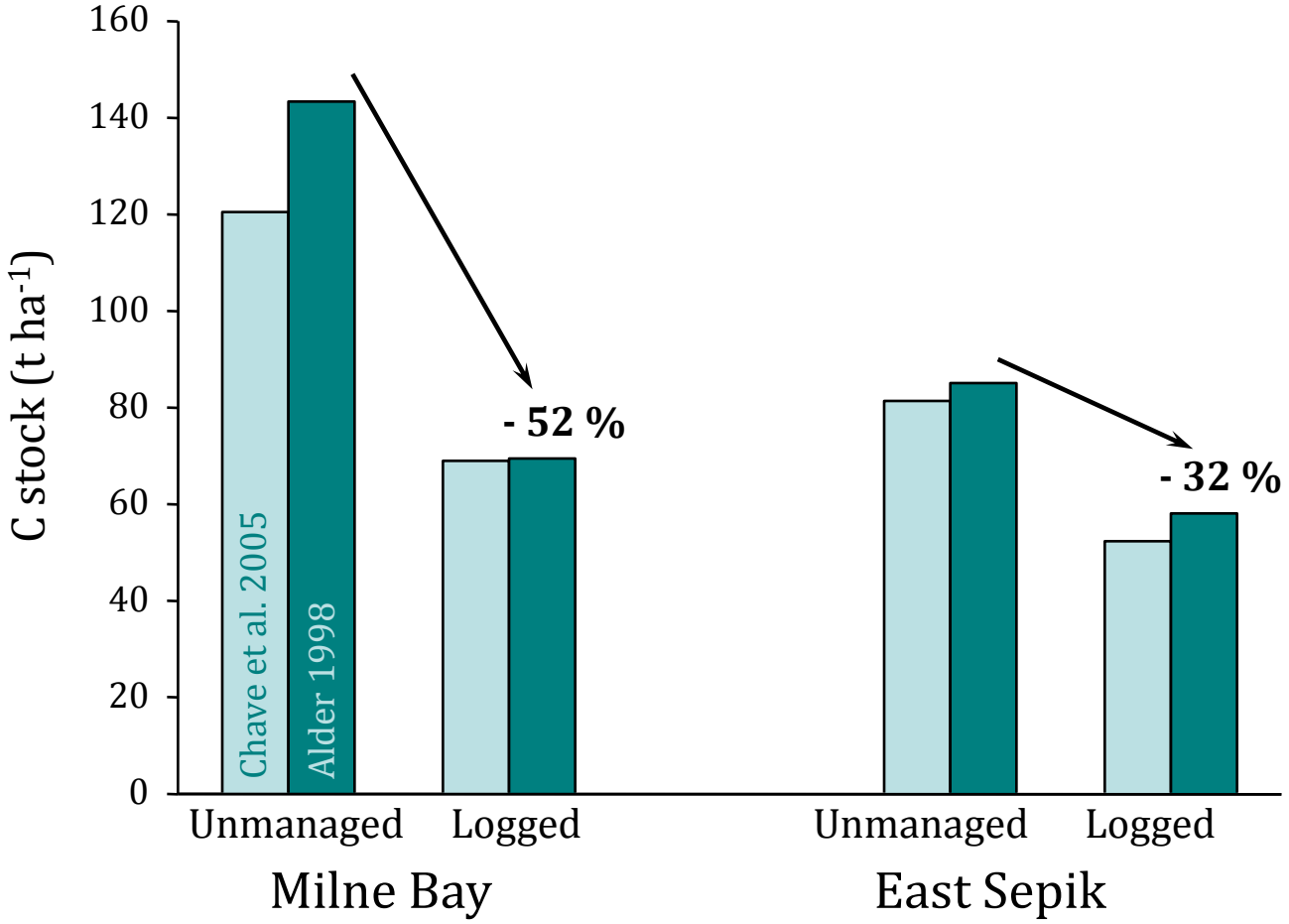
Papua New Guinea

Carbon stocks – wood density effect



Papua New Guinea

Carbon stocks – management effect



Conclusions

- Cooperations with pilot countries have been established assisting in national estimates of C-stocks on forest type level for:
  - Improved sampling methods
  - Enhanced assessment techniques
  - Compliance with at least IPCC Tier 2 criteria
- In many tropical countries a wealth of quality datasets is available:
  - To be unveiled and retrieved from various national and international institutions, NGOs, and scientists
  - Primarily forest survey data available

Outlook

Expected results to be presented at COP13:

- Suggestions for standardized national sampling designs
- Case studies on
  - Applicability of C-pool estimation methods on aboveground biomass
  - Comprehensive methods for soil C assessment of tropical rainforests
  - Quantitative evaluation of uncertainties associated with assessment procedures

Thank You for Your Attention

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