

Inventory of Carbon Stocks and Flora Diversity in South Sumatra

Biodiversity and Climate Change (BIOCLIME) Project

Presented in:

*Lokakarya Sosialisasi Data Spasial Kehutanan untuk Perhitungan Emisi Karbon dan Sinergi
Kolaborasi Mendukung Program Rencana Aksi Daerah Gas Rumah Kaca (RAD-GRK)
Provinsi Sumatera Selatan
Palembang, 13 October 2016*

Tatang Tiryana, Teddy Rusolono, Hendi Sumantri, Berthold Haasler

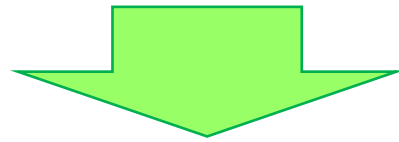


giz



What is the ICFD Project?

- **ICFD** = Inventory of Carbon Stocks and Flora Diversity
- a BIOCLIME-GIZ project to provide **baseline data** on **carbon stocks** and **flora diversity** in various forest types in South Sumatra



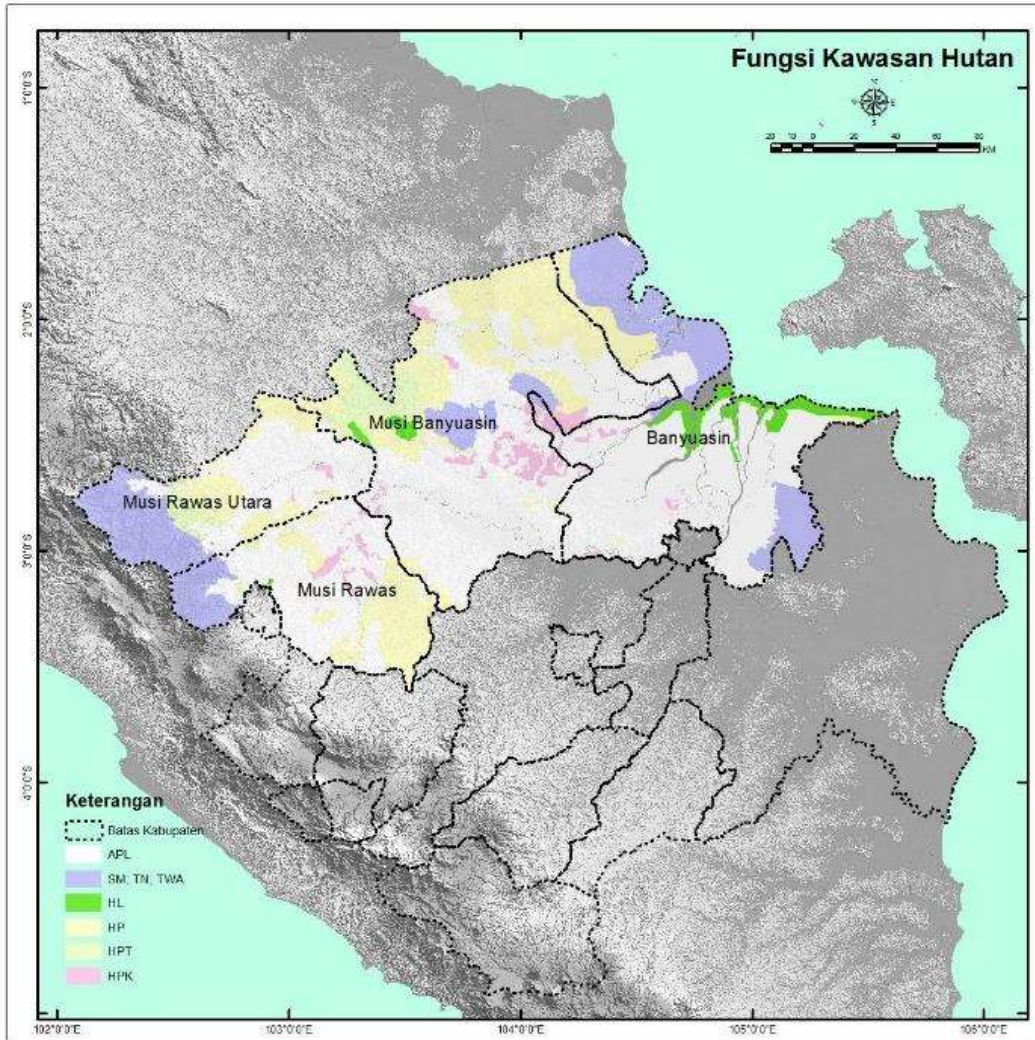
support the development of **FMU** and **FREL** of South Sumatra



enrich the **NFI data** for South Sumatra province

Project Area

- Forest areas in 4 districts:



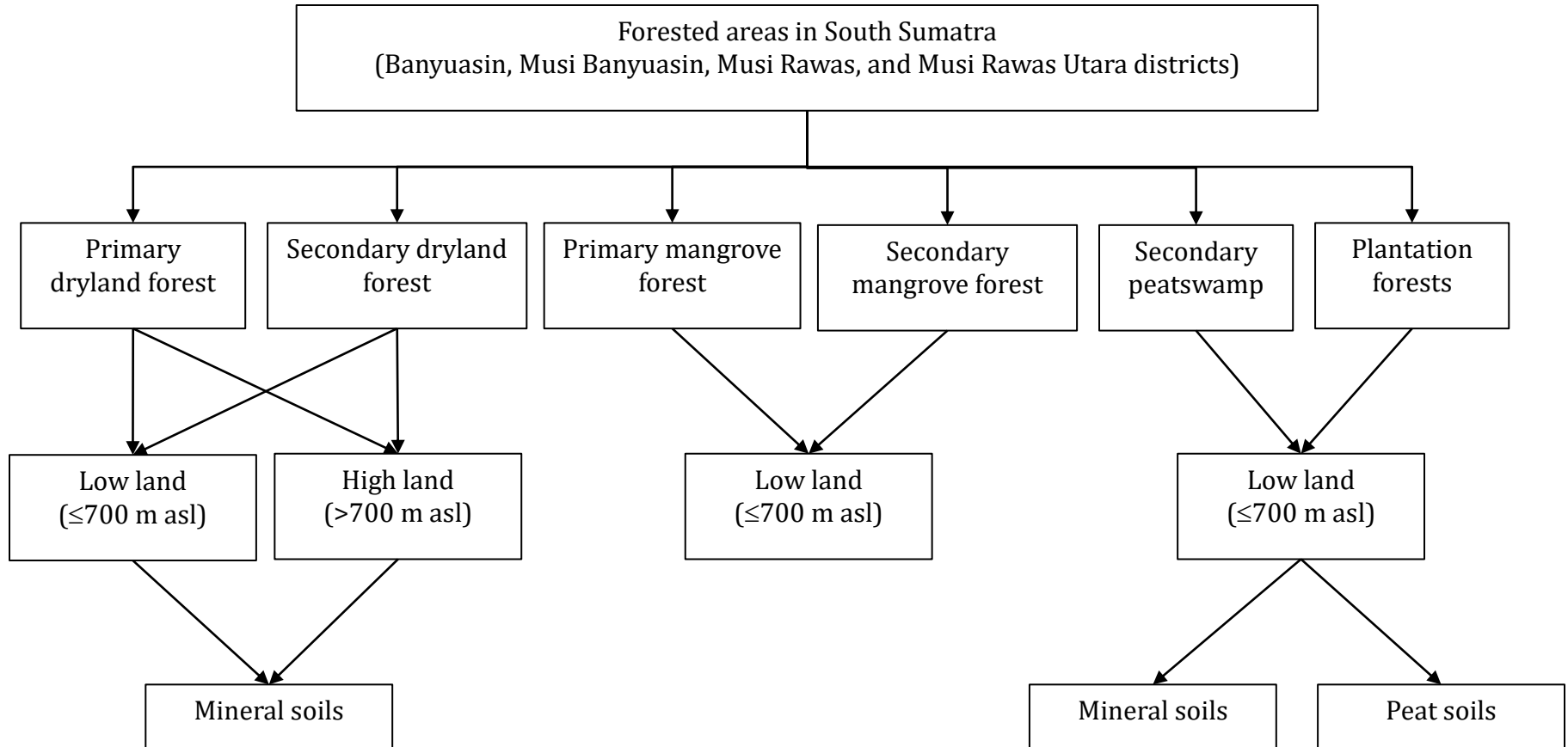
Total forest areas
1.707.070 ha (41%):

- Conservation (35,4%)
- Protection (5,2%)
- Limited production (8,2%)
- Production (44,3%)
- Convertible prod. (7,0%)

Very **diverse**
condition

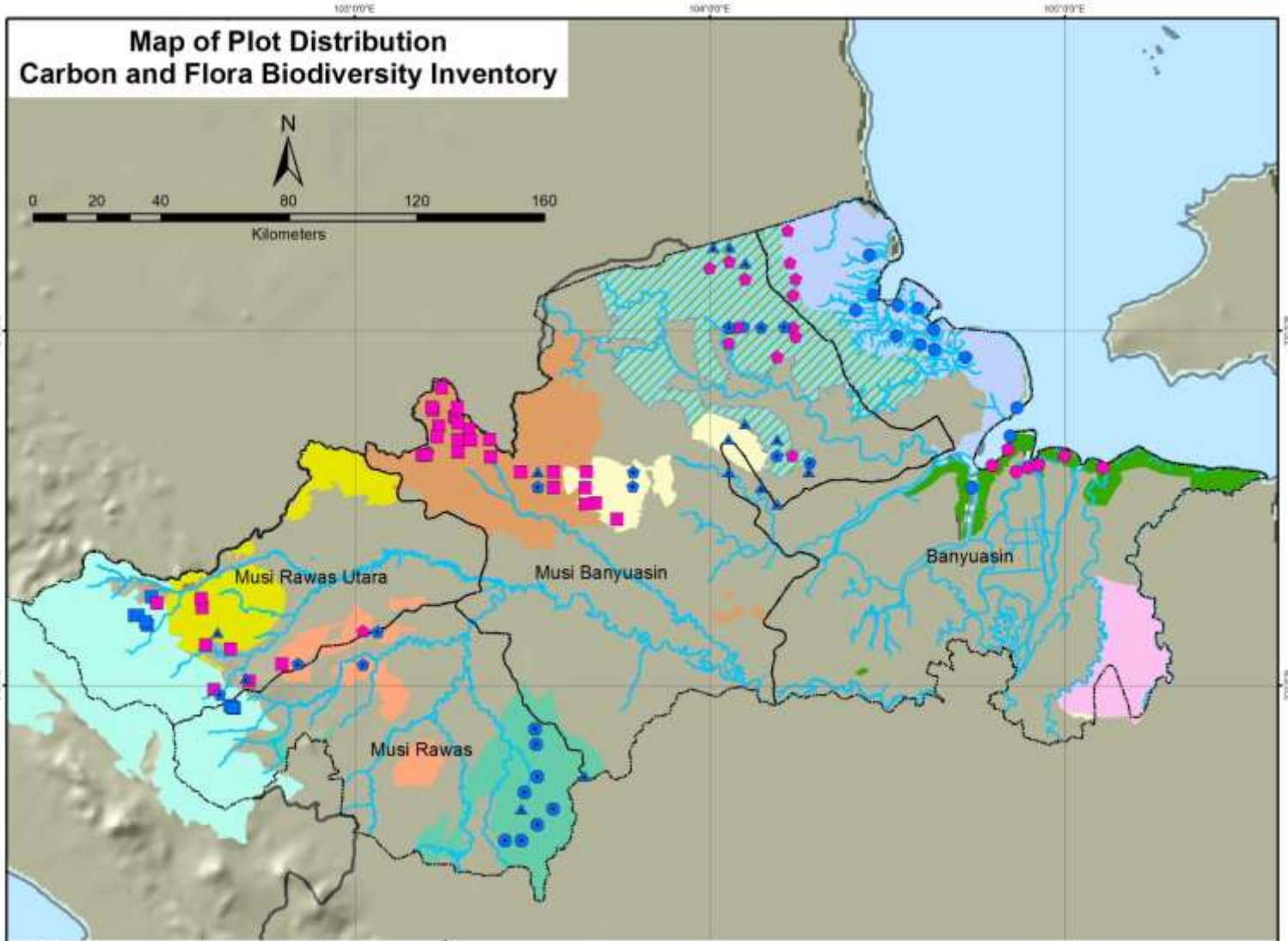
Project area...(2)

- **Stratification:** forest type, altitude, soil type



Sampling Design

- Systematic plot sampling: 5 km interval



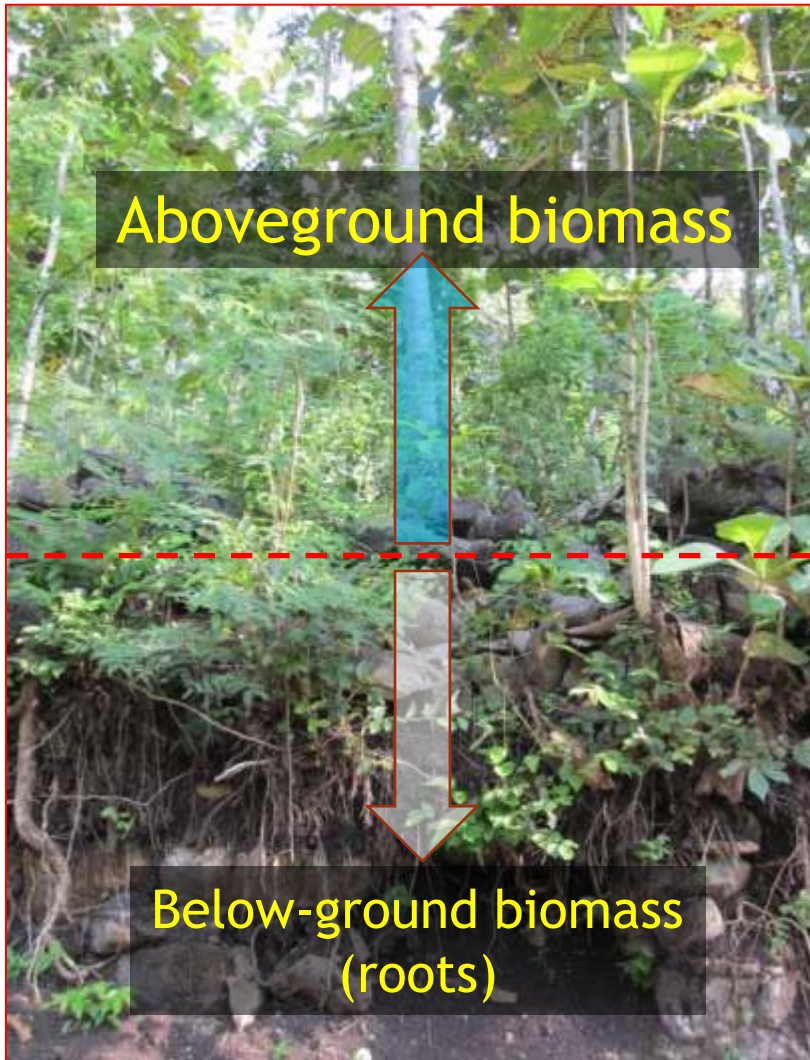
Sampling design...(2)

- Sample plot: 0,1 ha (rectangular, circular)

Stratum	Sample plots
Primary dryland forests (PDF)	9
Secondary dryland forests (SDF)	33
Primary mangrove forests (PMF)	13
Secondary mangrove forests (SMF)	7
Secondary peat swamp forests (SPSF)	17
Plantation forests (PF)	8
Estate crops (EC)	15
Shrubs (SB)	12
Total	114

Carbon stocks parameters

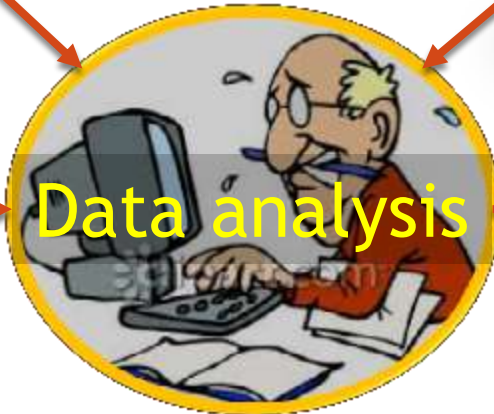
- **Five** carbon pools (IPCC 2006)



Biodiversity parameters

- Focus on **flora diversity**, which can be integrated into the plot measurement of carbon stocks:
 - **Structure** of vegetation
 - Species **composition**
 - Species **diversity**

Project Implementation



Project implementation...(2)

- ICFD involved various **partners**:
 - Research and Development Agency for E.F (**BP2LHK**)
 - Research Center for Biology **LIPI**
 - **Sembilang** National Park
 - **Kerinci Seblat** National Park
 - **BKSDA** South Sumatra
 - **KPH**/Forest Management Unit
 - **Local** people
 - **GIZ** Bioclimate



Field Survey

- Phase 1 (May – December 2015): **challenging...**



Field survey...(2)

- Phase 2 (January – May 2016): more challenging...



(C) Hendi Sumantri

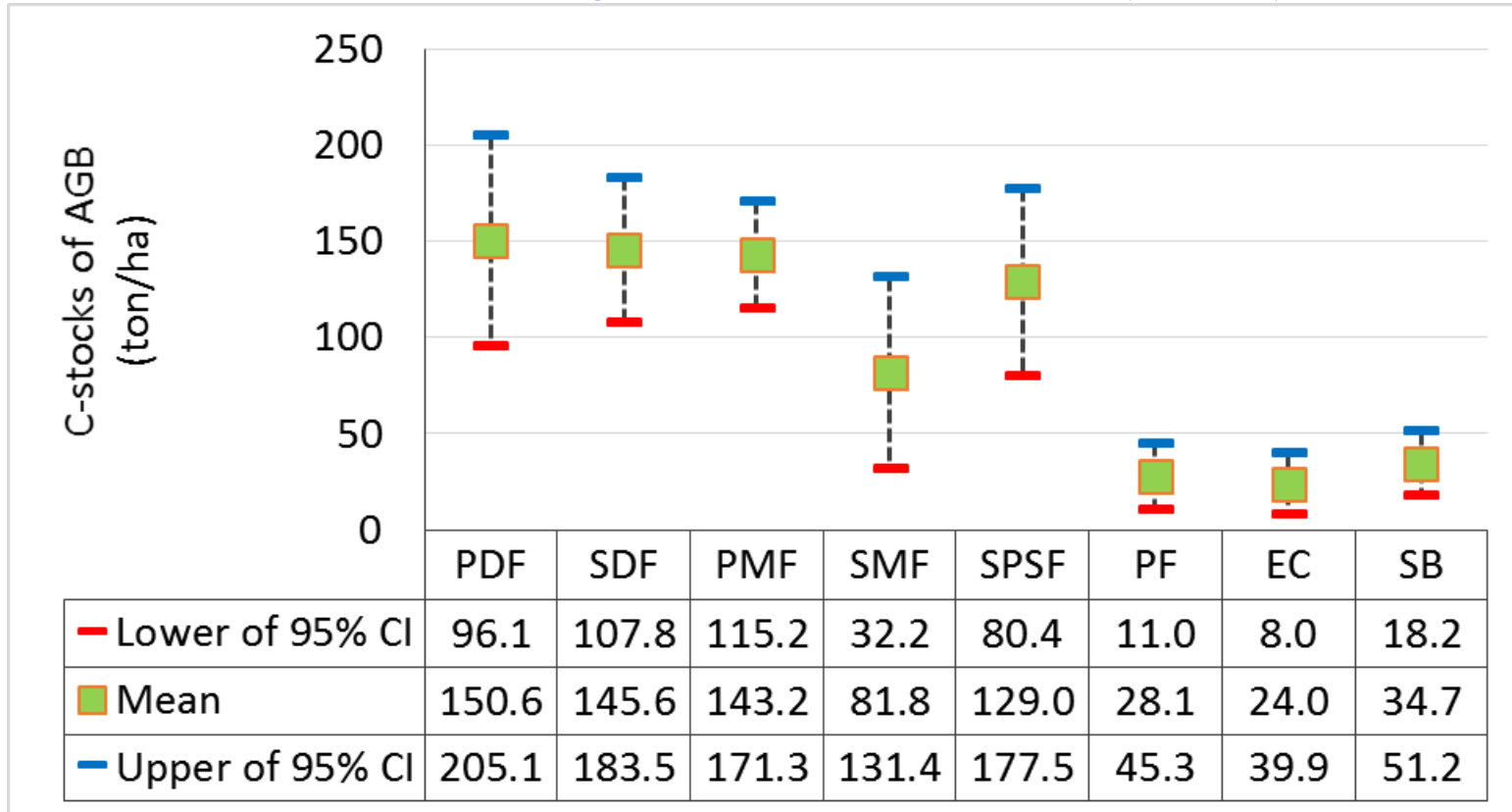
Data Verification

- Parai Beach Hotel, Bangka, 14–16 June 2016:
 - to correct some **mistakes** in the data inputs
 - to complement some **incomplete** data: **species** name, laboratory analysis of the **understory** vegetation, **litter**, and **soil samples**



Results: Forest Carbon Stocks

- C-stocks of aboveground biomass (AGB):

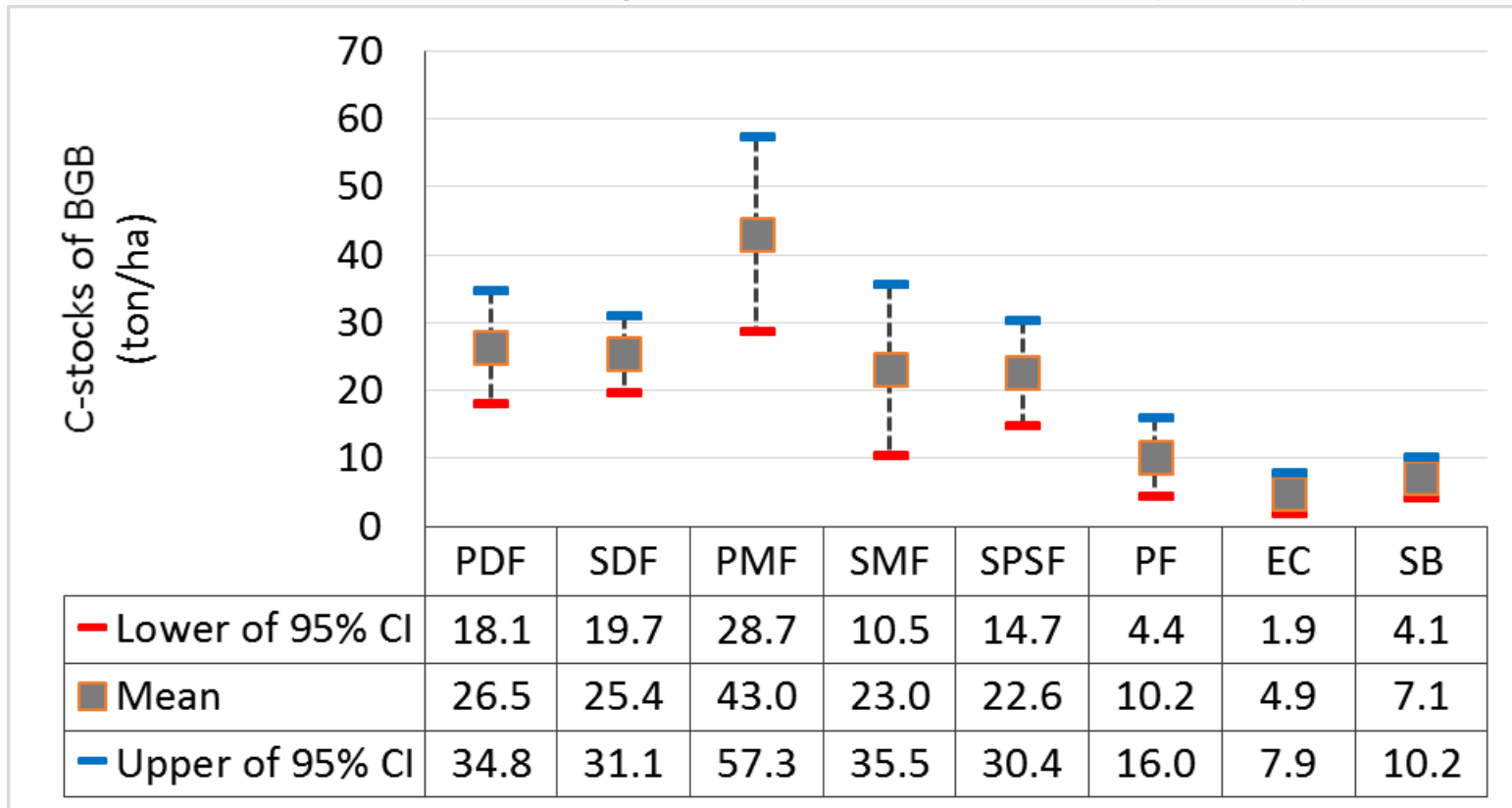


TNBD Jambi: **137 ton/ha**
(Kotowska *et al.* 2015)

A. mangium in MHP:
 • **24 ton/ha** (2.5 yrs)
 • **59 ton/ha** (5.5 yrs)
 (Heriansyah *et al.* 2007)

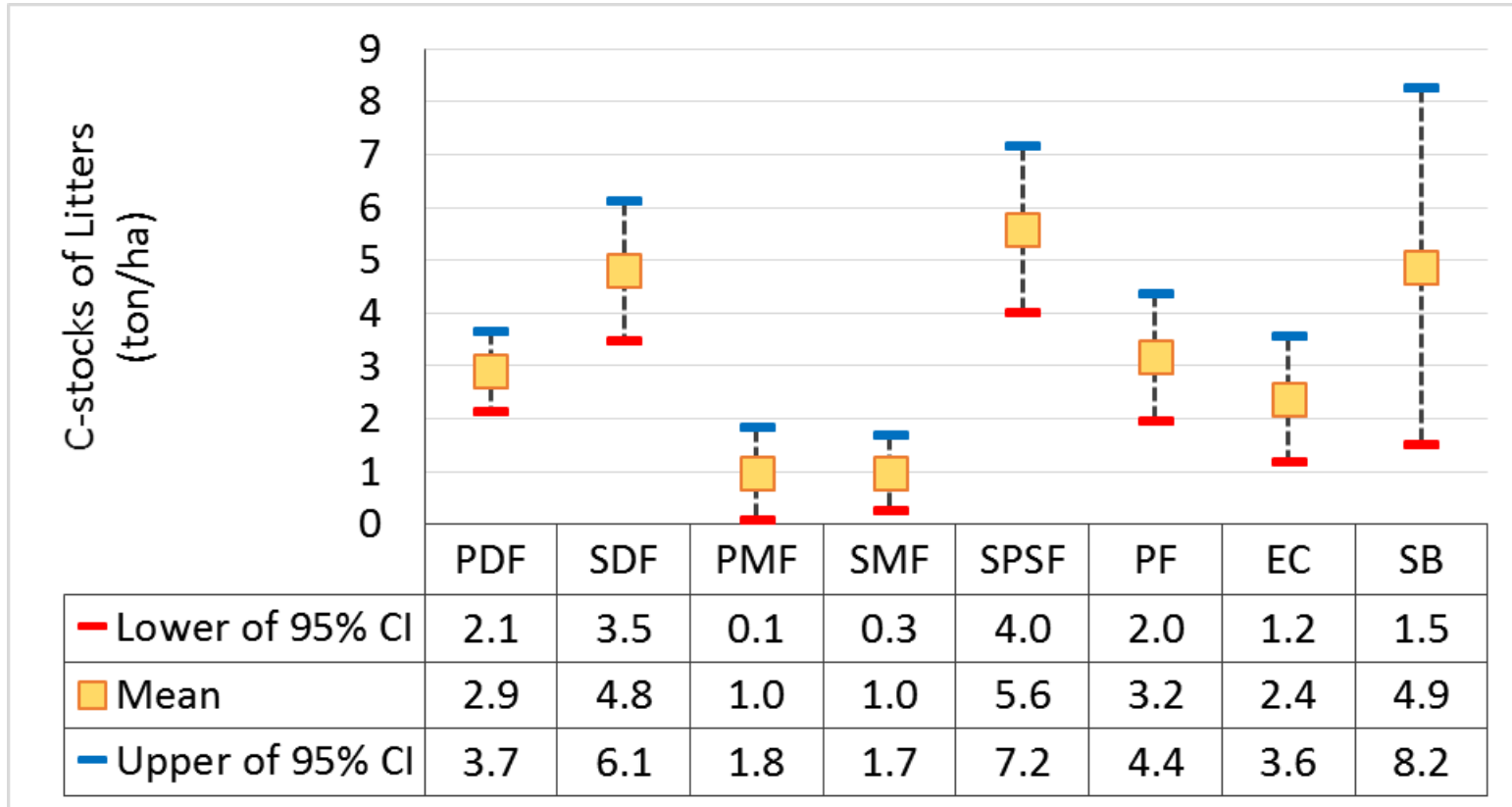
Forest carbon stocks...(2)

- C-stocks of **below-ground biomass (BGB)**:



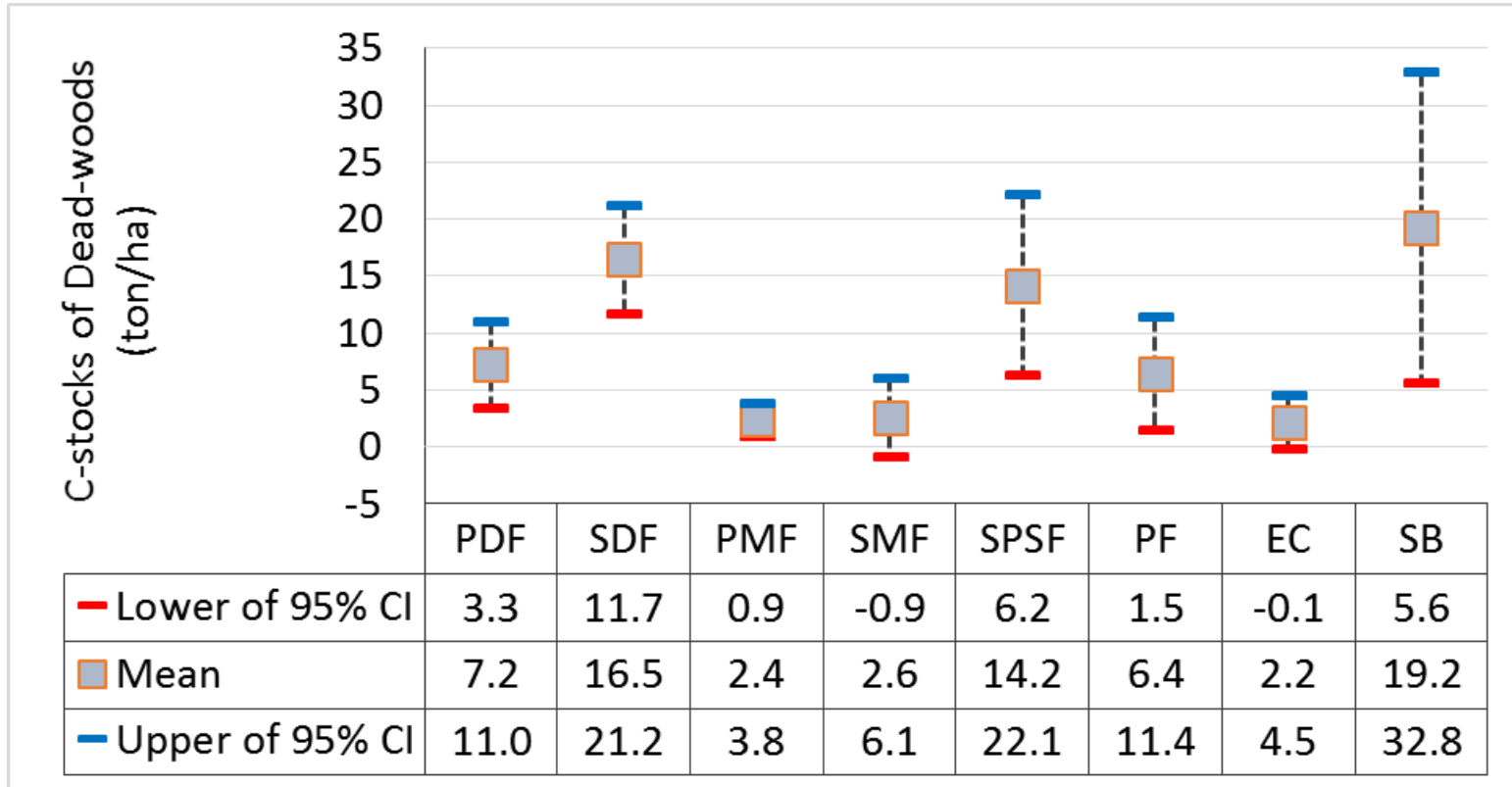
Forest carbon stocks...(3)

- C-stocks of **litters**:



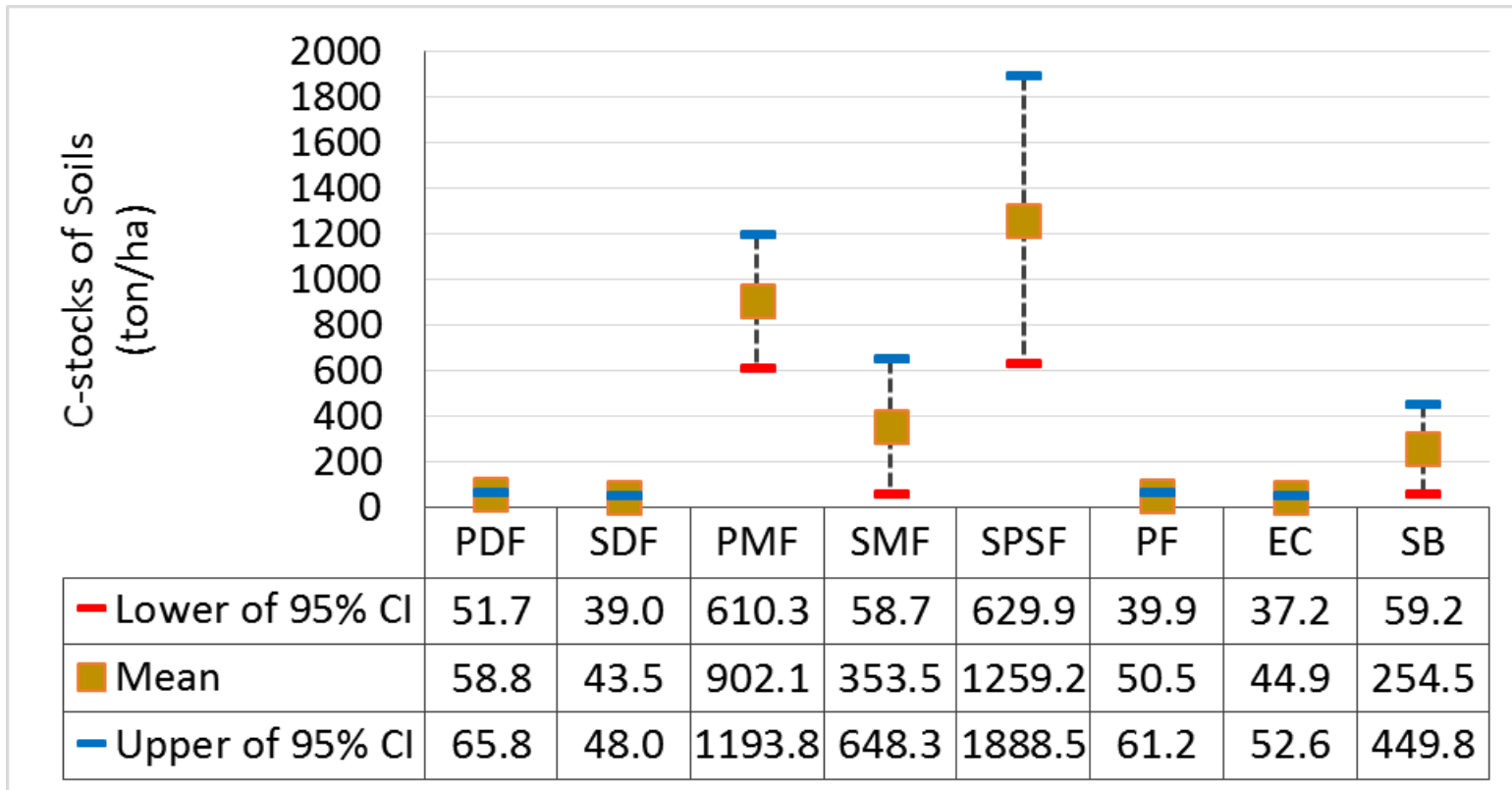
Forest carbon stocks...(4)

- C-stocks of **dead-woods**:



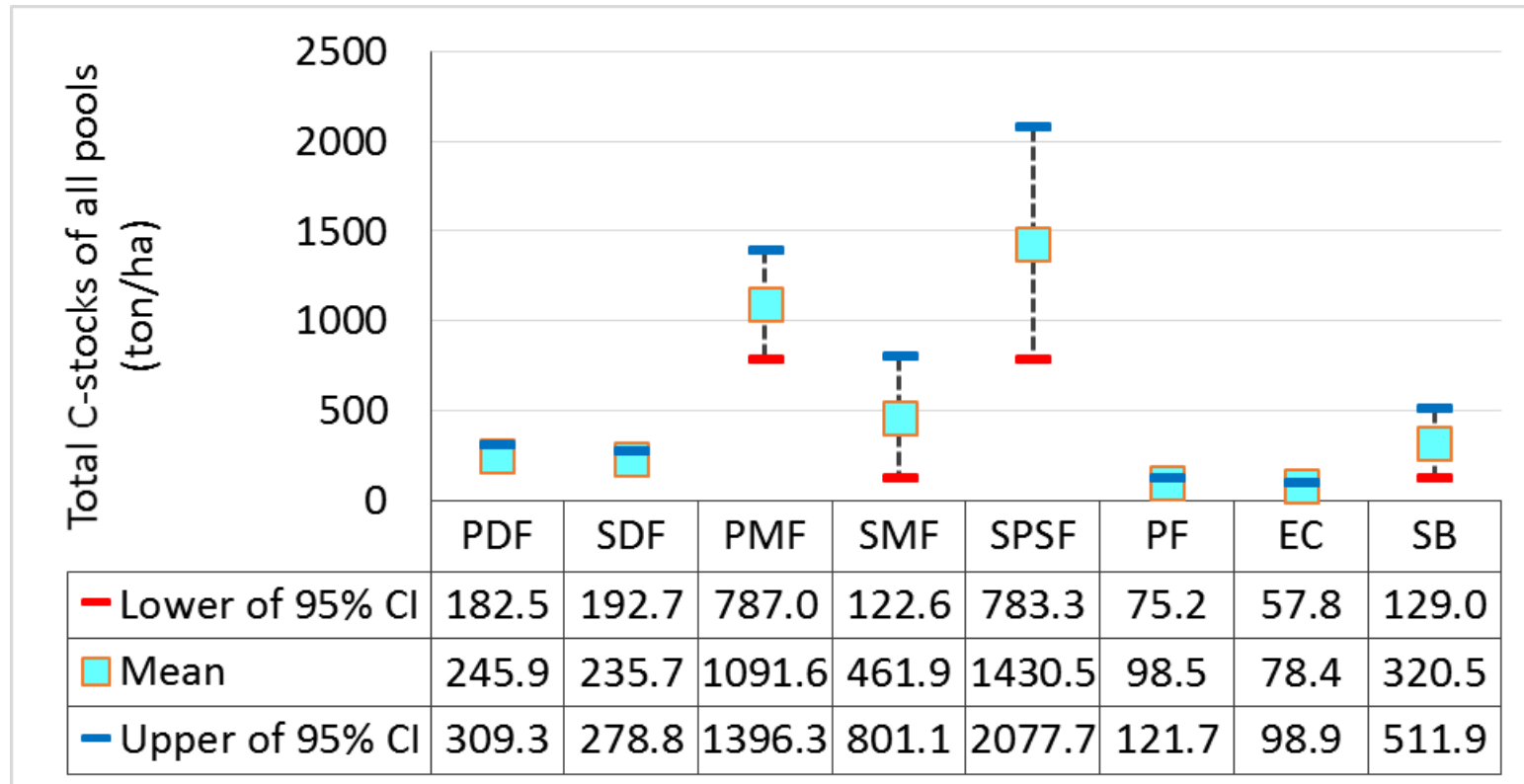
Forest carbon stocks...(5)

- C-stocks of soils:



Forest carbon stocks...(6)

- Total C-stocks of all carbon pools:



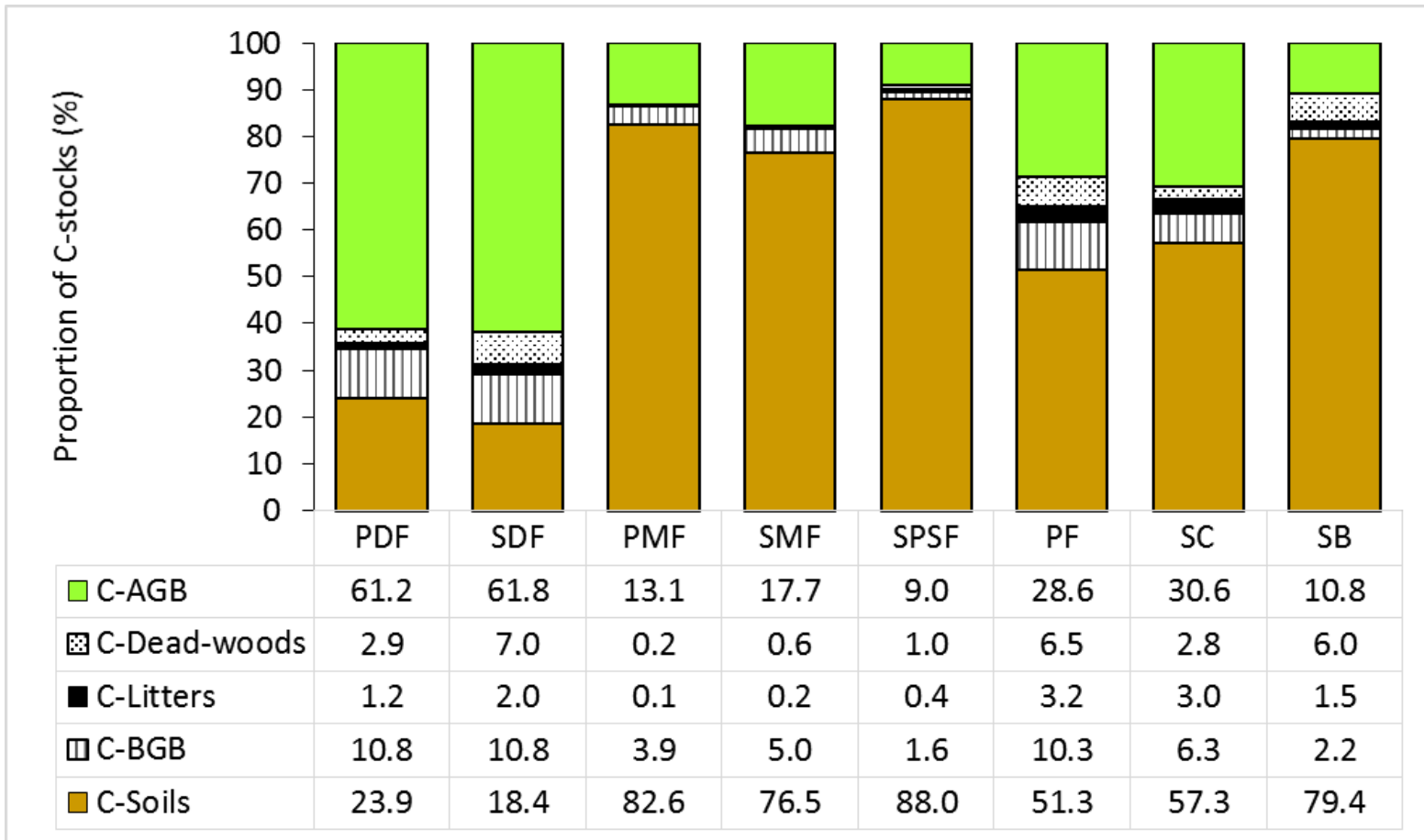
Forest carbon stocks...(7)


- Total C-stocks...

Study	Location	Total C-stocks (ton/ha)			
		PMF	SMF	SPSF	EC
ICFD (this study)	Sumsel	1092	462	1430	78
Murdiyarso <i>et al.</i> (2010)	TNTP (Kalteng)	-	-	894	-
Murdiyarso <i>et al.</i> (2015)	TNTP (Kalteng)	1240	-	-	-
	TN Bunaken (Sulut)	938	-	-	-
	Kubu Raya (Kalbar)	794	-	-	-
	Cilacap (Jateng)	-	593	-	-
Kotowska <i>et al.</i> (2015)	Jungle rubber (Jambi)	-	-	-	72
	Palm-oil (Jambi)	-	-	-	33

Forest carbon stocks...(8)

- Proportion of C-stocks:

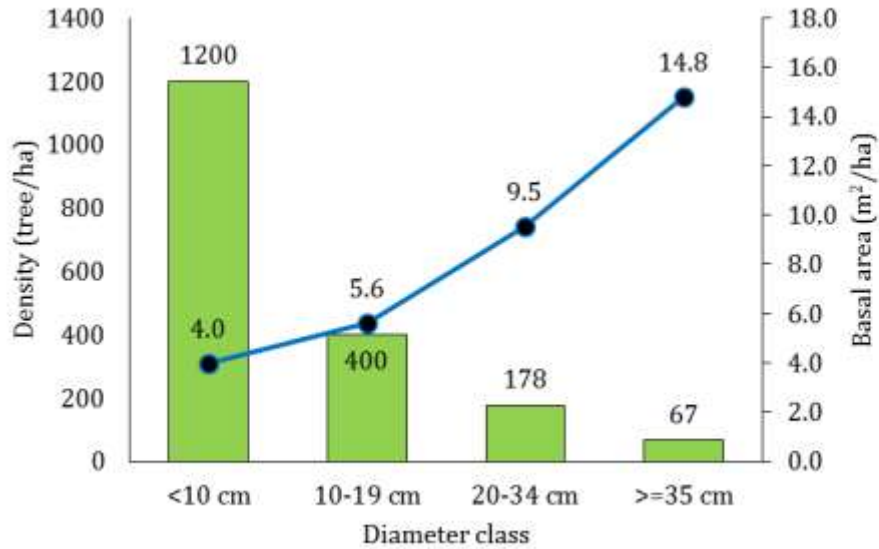



 C-soils in PSF at TNTF: **63%–82%**
 (Murdiyarso *et al.* (2010))

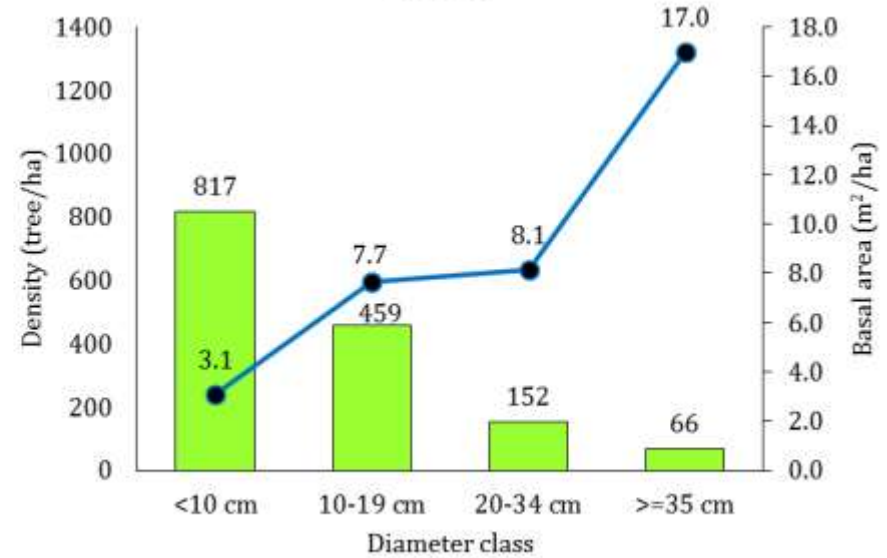
Results: Flora Diversity

- Structure of vegetation:

(a) PDF

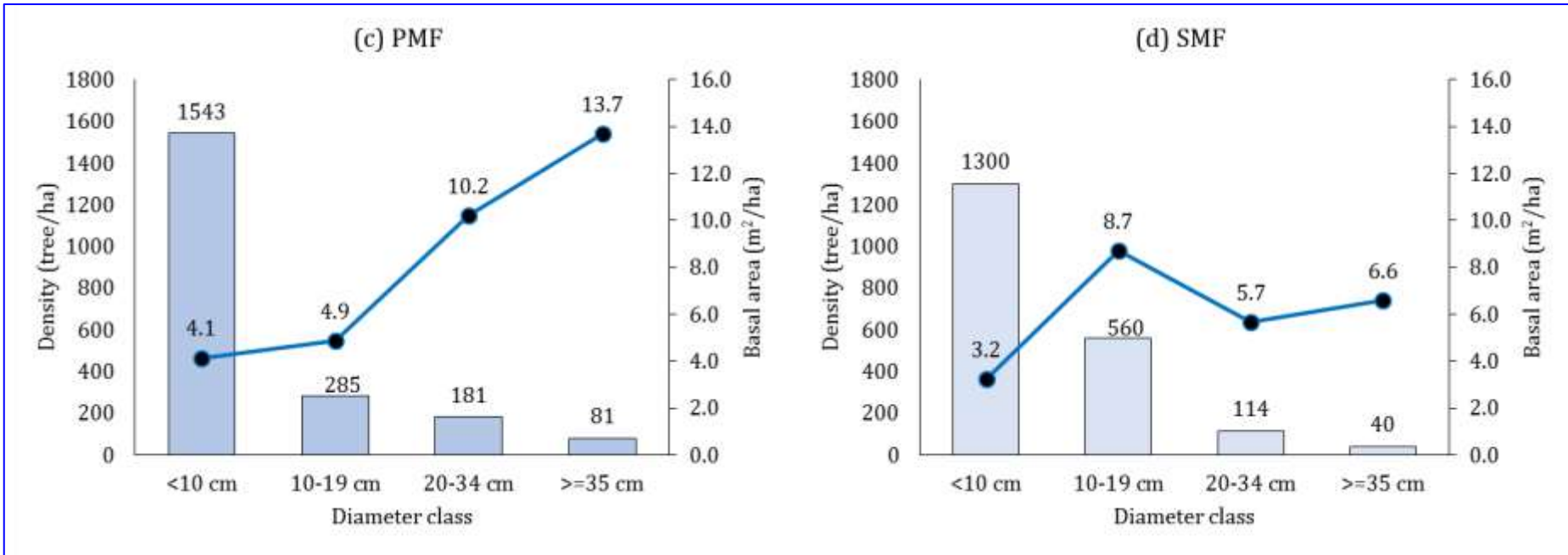


(b) SDF



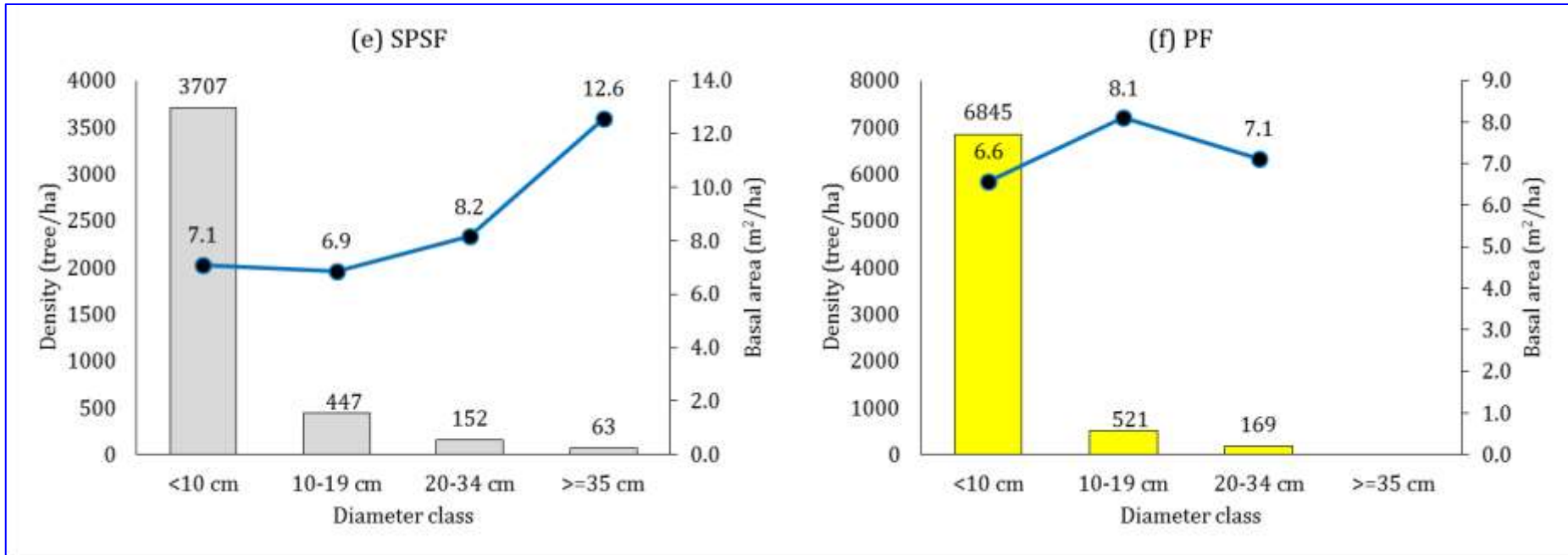
Flora diversity...(2)

- Structure of vegetation...



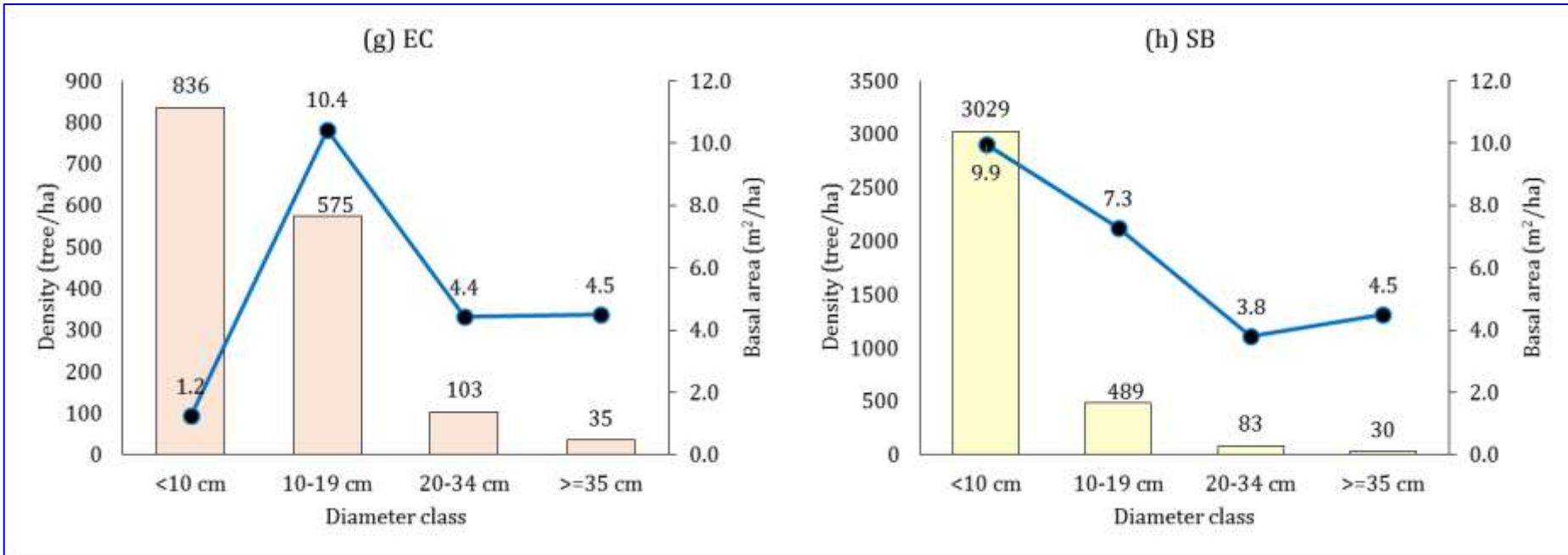
Flora diversity...(3)

- Structure of vegetation...



Flora diversity...(4)

- Structure of vegetation...



Flora diversity...(5)

- Species **composition**: **differ** among strata/habitats
 - Total: **415** species, 182 genus, 66 family (of 114 plots)
 - **PDF**: 84 species (DBH ≥ 10 cm)
 - *Dysoxylum* sp., *Artocarpus elasticus*, *Koompassia excelsa*, *Syzygium* sp., *Durio zibethinus* → **IVI=52%**
 - **SDF**: 220 species (DBH ≥ 10 cm)
 - *Endospermum diadenum*, *Ficus variegata*, *Cratoxylon arborescens*, *Shorea leprosula*, *Macaranga gigantean* → **IVI=39%**
 - Dominant species: **pioneer species** in disturbed natural forests

Flora diversity...(6)

- Species **composition**...
 - The critically **endangered** species in TNKS:



Tembalum (*Parashorea malaanonan* Merr)

Flora diversity...(7)

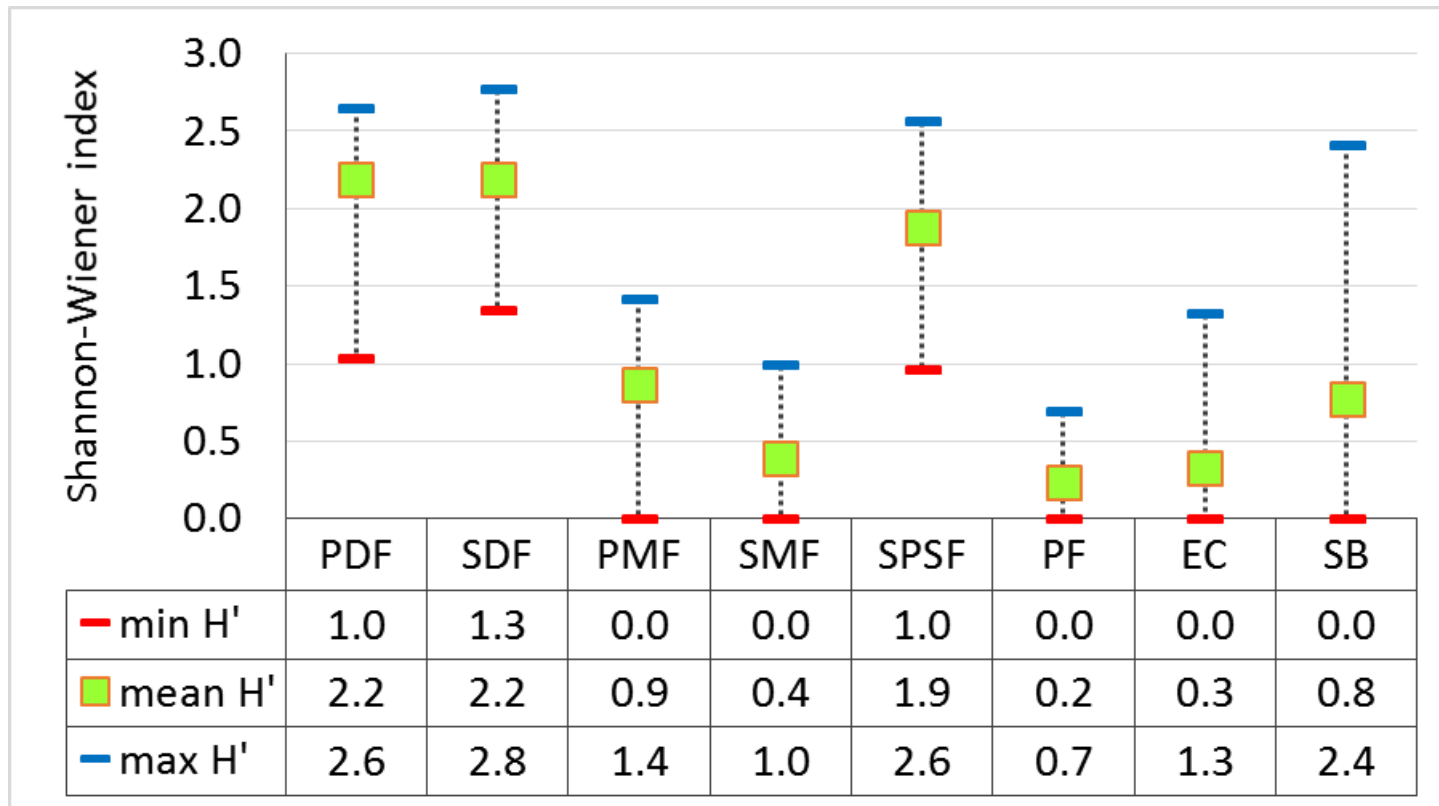
- Species **composition**...
 - **SPSF**: 86 species (DBH ≥ 10 cm)
 - *Koompassia malaccensis*, *Tetramerista glabra*, *Macaranga peltata*, *Shorea dasypylla*, *Gluta renghas* \rightarrow IVI = 51%
 - **PMF**: 8 species (DBH ≥ 10 cm)
 - *Bruguiera gymnorrhiza*, *Rhizophora apiculata*, *Rhizophora mucronata*, *Xylocarpus granatum*, dan *Bruguiera sexangula* \rightarrow IVI = 260%
 - **SMF**: 10 species (DBH ≥ 10 cm)
 - *Excoecaria agallocha*, *Rhizophora apiculata*, *Bruguiera gymnorrhiza*, *Sonneratia caseolaris* dan *Avicennia marina* \rightarrow IVI = 236%

Flora diversity...(8)

- Species **composition**...
 - **PF**: 5 species (DBH ≥ 10 cm) \rightarrow burnt areas
 - *Acacia mangium* (IVI = 203%), *Hevea brasiliensis*, *Eucalyptus pellita*, *Gmelina arborea*, *Macaranga peltata*
 - **EC**: 14 species (DBH ≥ 10 cm) \rightarrow community's lands
 - *Hevea brasiliensis* (IVI = 202%), *Elaeis guineensis*, *Atuna excelsa*, *Bridelia glauca*, *Alstonia angustiloba*
 - **SB**: 39 species (DBH ≥ 10 cm)
 - *Melaleuca cajuputi*, *Combretocarpus rotundatus*, *Acacia mangium*, *Gironniera nervosa*, *Alstonia pneumatophora*
 \rightarrow IVI = 102%

Flora diversity...(9)

- Species diversity...
 - Plot level H' : PDF, SDF, SPSF → higher diversity



Flora diversity...(10)

- Species diversity...
 - Sorenson's dissimilarity index: mostly differ

Stratum	PDF	SDF	PMF	SMF	SPSF	PF	EC
SDF	0.77						
PMF	1.00	1.00					
SMF	1.00	1.00	0.56				
SPSF	0.94	0.90	0.98	0.96			
PF	1.00	0.99	1.00	1.00	0.98		
EC	1.00	0.97	1.00	1.00	0.98	0.89	
SB	0.92	0.86	1.00	1.00	0.89	0.91	0.96

Conclusions

- **Carbon stocks** in South Sumatra:
 - **PDF & SDF** (the largest forest ecosystems) stored highest **aboveground** carbon stocks (62%)
 - Belowground carbon stocks were mostly stored in wetland ecosystems (SPSF 88%, PMF 77%, peat shrubs 79%)
- **Flora diversity** in South Sumatra:
 - **Remnant forests** still contained relatively high diversity: **415** species from 182 genus and 66 family
 - **PDF & SDF** have highest flora diversity
 - **Wetland** ecosystems (peat and mangrove forest) have **lower** flora diversity than dryland ecosystems.

Thank you

Terima kasih