CARBON STORAGE AND THE ROLE IN CLIMATE CHANGE MITIGATION OF CAIMPUGAN PEATLAND IN AGUSAN MARSH, PHILIPPINES

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SEARCA-ADSS

Outline of Presentation

- Intro: What about peatlands and climate change?
- Peatlands in the Philippines
- Objectives of the Study
- Conceptual Framework
- Materials and Methods
- Results and Discussions
- Conclusion
- Challenges

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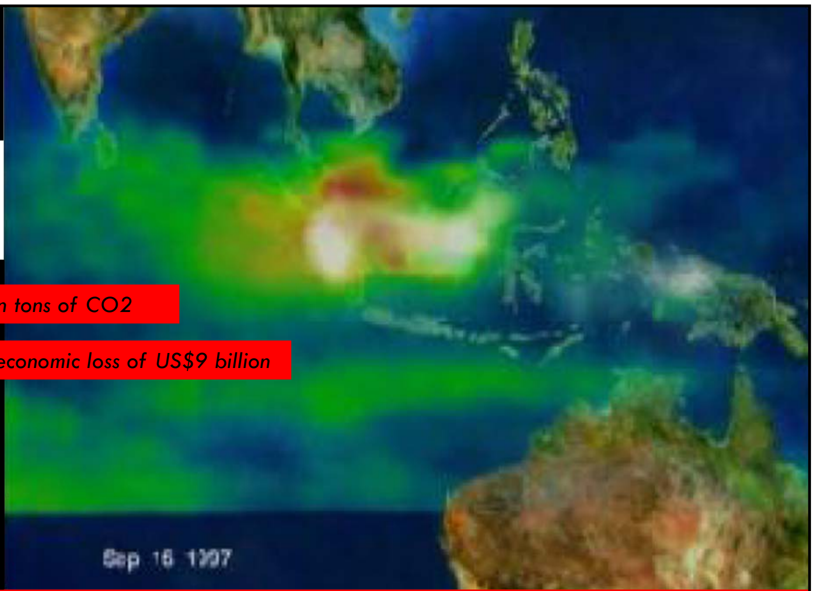
What about peatlands and climate change?

400 million tons of CO_2

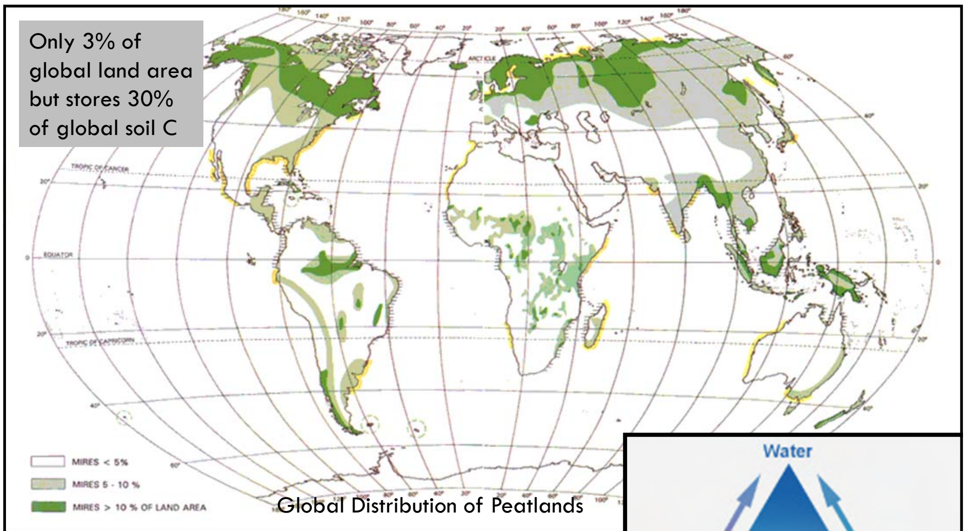
estimated economic loss of US$9 billion

A significant ***C sink*** has become an equally significant ***C source***



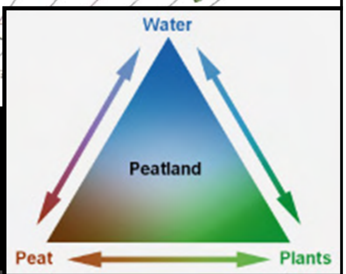
"Haze" from the forest/peatland fires blankets much of SE Asia - Sept. 1997 (NASA satellite image)

Only 3% of global land area but stores 30% of global soil C



Global Distribution of Peatlands

Peatlands are wetland ecosystems in which the production of organic matter exceeds its decomposition and net accumulation results (Page, 2006).

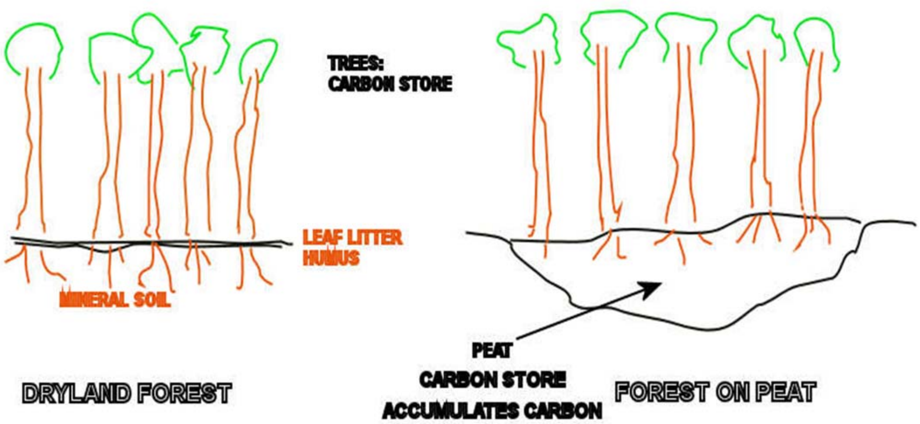


FYI : Peatlands in Climate Change Scenarios

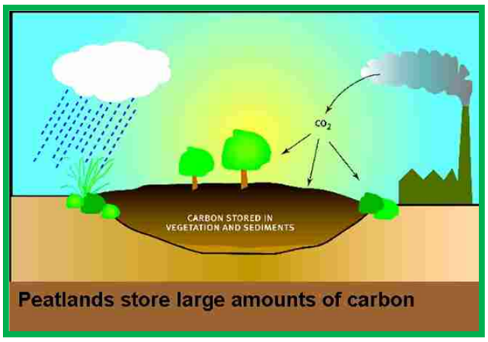
1. 3% of the world's area, contain at least 550Gt of C in their peat. Equivalent to 30% of the global soil C, 75% of all atmospheric C, equal to all terrestrial biomass, and twice the carbon stock in the forest biomass of the world. (Assessment on Peatlands, Biodiversity and Climate Change, 2008).
2. Contain more carbon per ha than other ecosystems on mineral soil; in the sub-polar zone, 3.5 times; in boreal zone 7 times; in the tropical zone 10 times as much. (Assessment on Peatlands, Biodiversity and Climate Change, 2008).
3. This long term ability of peatlands to absorb carbon dioxide from the atmosphere means that they play a major role in moderating atmospheric CO_2 concentrations which has a direct impact in moderating global climate (Holden, 2005).
4. Carbon storage in SE ASIAN peatlands:
   - Depends on peat area, peat thickness = volume and
   - Carbon content / unit volume

Peatlands: Carbon Store and Sink

Peatlands in their natural state are mostly a C store and a C sink



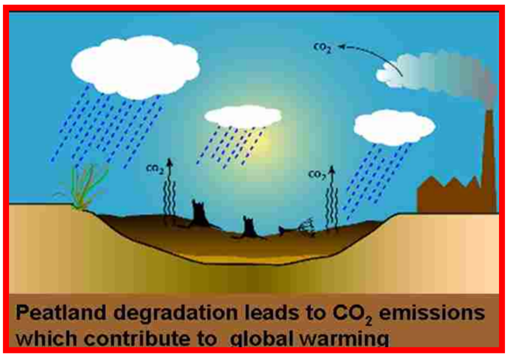
Davies, 2010 for Global Environment Center.



A tale of two reverse scenarios..

C sink

C source



Source : Wetlands International

Status of Peatlands

- Cleared and drained for food and cash crops such as oil palms and other plantations
- Exploited for timber
- Drained for plantation forestry
- Extracted for industrial and domestic fuel
- Horticulture and gardening

Photos: Dr. Suwido Limin, 2007

Peatlands in the Philippines

Source: IFAD-GEF Project Proposal, Philippine Sub-Component, Assessment of SEA peatlands, 2006.

Areas in the Philippines that are reported to have peatlands (Philippine Sub-Component for IFAD-GEF Project Proposal, 2006).

1. Ligawasan Marsh in Mindanao
2. Dolongan area in Basey, Western Samar (Bureau of Soils, 1975. Soil Survey of Samar Provinces, Philippines. Reconnaisance Soil Survey and Soil Erosion Survey)
3. Southern Leyte (Whitmore1984 Mt. Pulag in Northern Luzon (Leonard Co, pers. comm.)
4. Surigao del Norte, Northeastern Mindanao (Edwino Fernando, pers. comm.)
5. Agusan Marsh (NE Mindanao)

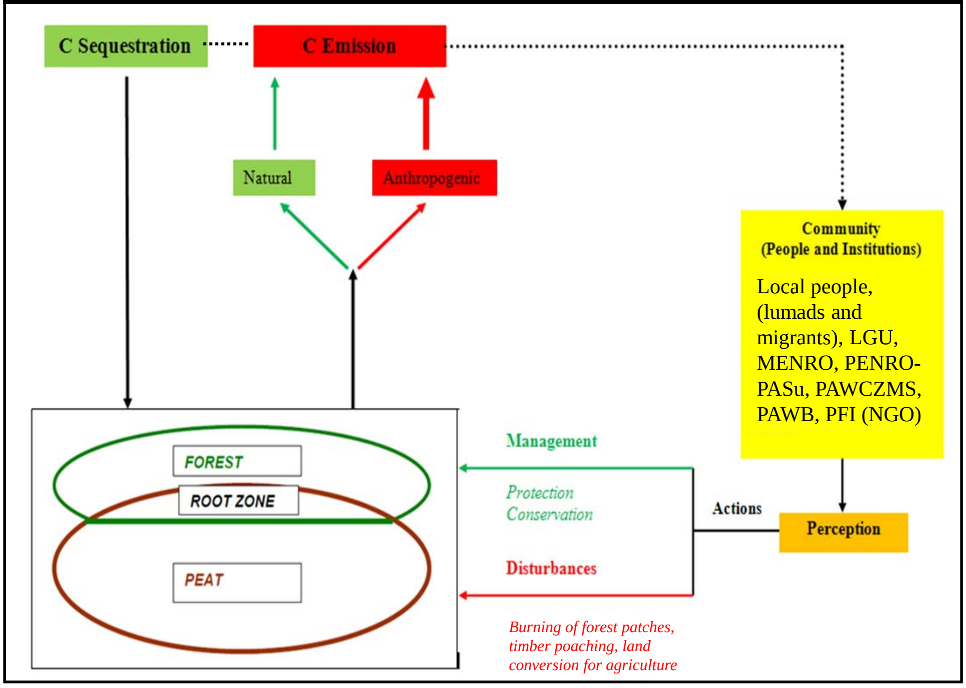
Like Leyte Sab-a peatland, Bunawan peatland in Agusan Marsh are considered degraded

Photo credits : DENR-CARAGA taken in 1991, Bunawan peat area

Objectives of the Study

- Determine the aboveground C storage of Caimpugan peatland in the following pools: trees, understorey and herbaceous vegetation, and litter as well as its belowground C storage which pertains to the peat soils at different horizons;
- Identify the present role of the peatland in the context of climate change.

Conceptual Framework

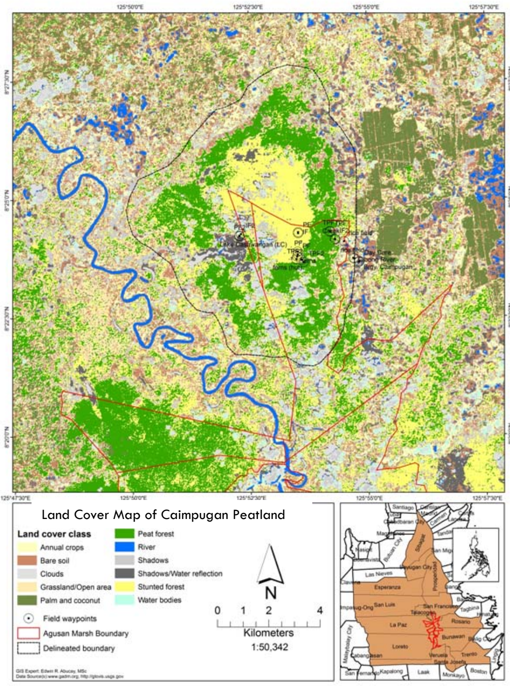


Materials and Methods

Description of Study Site

- Caimpugan peatland
- 5,325 hectares (DENR Survey)
- Covers the municipalities of San Francisco and Talacogon
- Located within the Agusan Marsh but only a portion is within the boundaries of the AMWS (NIPAS PA)
- Ombrotrophic peatdome

(rainfall is the only source of water, unique concentric vegetation (TPF-IF-PF, peat deposit is deepest at the central portion, the first and still the only one identified in the country)



Materials and Methods

Stratification of the study area

Trees Species			Location 1			Location 2		
Local Name	Family	Scientific Name	TPF	IF	PF	2TPF	2IF	2PF
Puti-an	Alangiaceae	Alangium meyeri (Merr.)	1	1	1	1	1	1
Tiga	Myrtaceae	Tristaniopsis micrantha (Merr.)	1	1	1	1	1	1
Tagkan	Sapotaceae	Palaquim pinnatinervium (Elm.)	1	0	0	1	1	0
Malapapaya	Araliaceae	Polyscias nodosa (Blume.)	0	0	1	0	0	0
Malatambis	Myrtaceae	Syzygium hutchinsonii (Merr.)	0	0	0	0	0	1

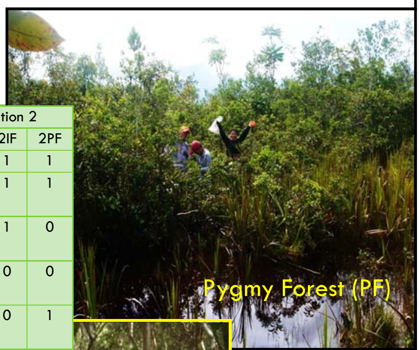


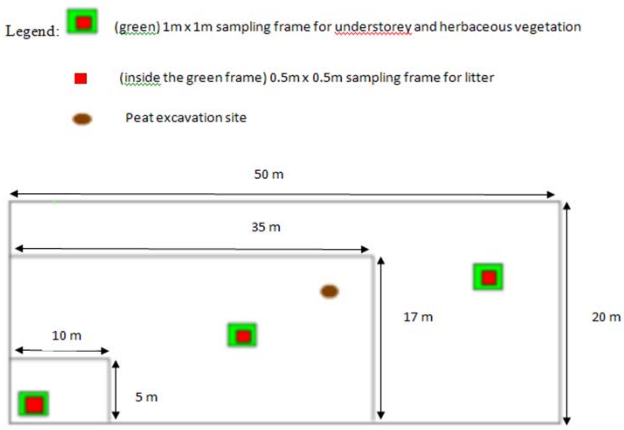
Photo: VLBA, 2010

3 strata used are in accordance to the observation of the phasic communities Dr. Jon Davies (2006) in Caimpugan peatland

Materials and Methods

- *Identification of C pools to measure*
  - Aboveground
    - Trees
    - Understorey and herbaceous vegetation
    - Litter
  - Belowground
    - Peat at different horizons

- *Sampling Plots*

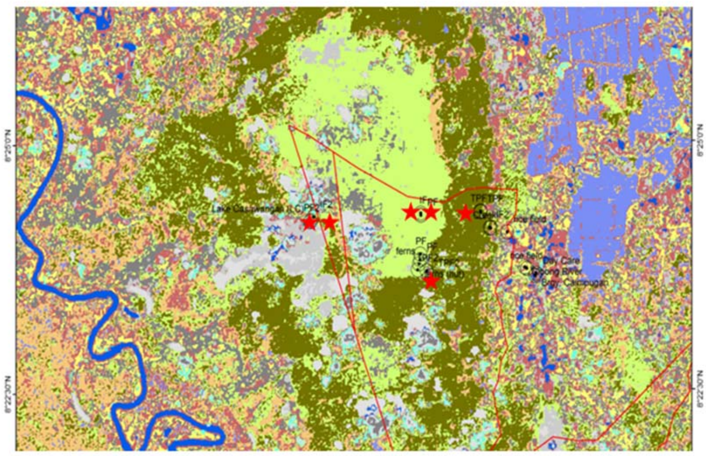


Three-nest rectangular sampling plot.

(Sourcebook for Land-Use Change and Forestry Projects of BioCF and Winrock International, Pearson, Walker and Brown, 2005).

Materials and Methods

Location of Sampling Plots



3 nested plots in each vegetation zone (as replicates)

total of 18 nested plots

Materials and Methods

Biomass and Methods of C Analysis

Standing trees : (Biomass equation formula) by Brown, 1997 for wet tropical forests

Biomass = 21.297 – 67.953 x dbh + 0.740 x dbh^2

Understorey and herbaceous vegetation :

Fresh weight (300g sample)→ oven dry weight

(80^0 C until constant weight was achieved)

Litter:

Fresh weight (300g sample)→ oven dry weight

(80^0 C until constant weight was achieved)

** (multiplied by 45%, default value for C content)

Peat:

samples subjected to Von Post Scale of Humification with corresponding bulk densities

laboratory analysis (Flash Elemental Analyzer 1112 Series Carbon Analyzer for TOC at ASL, IRRI)

C (t/ha) = [(soil bulk density (g/m^3) x soil depth (cm) x C content)] x 100.

Materials and Methods

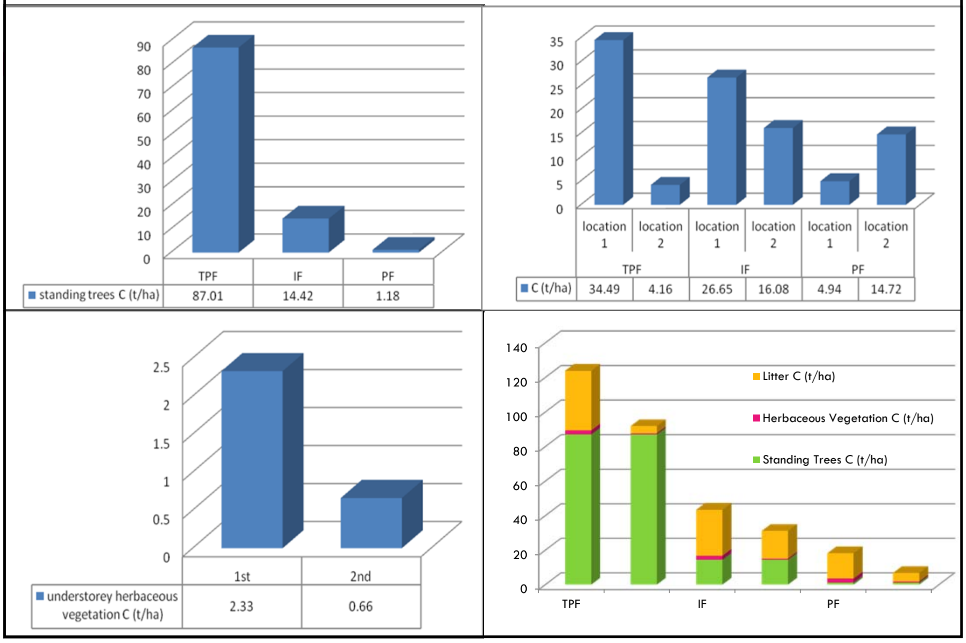
Data Analysis

- two factor factorial in complete randomized design
- test procedure used was a two-way ANOVA with selected vegetations and locations as factors
- Duncan's Multiple Range Test

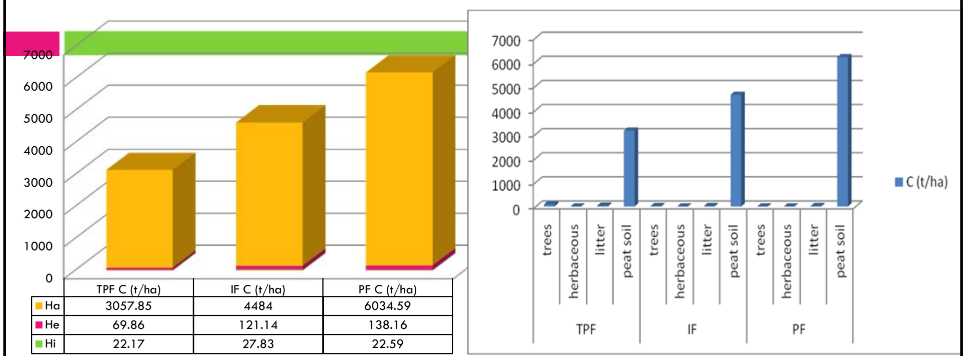
Null Hypotheses:

1. There is no significant difference in C storage in standing trees between the three vegetation zones and in the two sampled locations.
2. There is no significant difference in C storage in for understorey vegeatio between the three vegetation zones and in the two sampled locations.
3. There is no significant difference in C storage in for litter between the three vegetation zones and in the two sampled locations.
4. C stocks in the peat soil of Caimpugan peatland does not significantly differ from the belowground C stocks.

Results : Aboveground C stocks



Results : Belowground C stocks



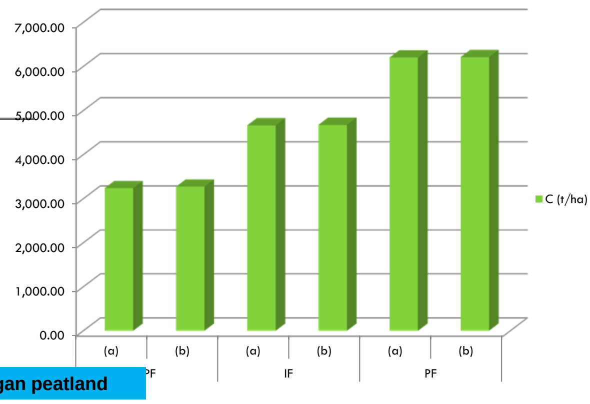
Comparison of C stocks (t/ha) in both aboveground and belowground C pools.

Vegetation	Total Aboveground C	Total Belowground C	Difference
Tall Pole Forest	91.83-123.83	3,148.88	25.42-34.29
Intermediate Forest	31.16- 43.4	4,632.97	106.75-148.68
Pygmy Forest	8.45-16.56	6,195.34	374.11-733.17

Results : Total C storage

Total C stocks per vegetation zone in Caimpugan peatland.

Vegetation	Total C stocks
Pygmy Forest	6,203.709 – 6,211.9 t/ha
Intermediate Forest	4,664.13- 4,676.37 t/ha
Tall Pole Forest	3,240.71- 3,272.71 t/ha



Estimation of total C storage of Caimpugan peatland

Vegetation Zone	Area (in has)	C Storage (t/ha)	
		Conservative	Less Conservative
TPF	3,771.33	3,240.71	3,272.71
PF	1,715.31	6,203.79	6,211.9
Total C storage	5,486.64	22,863,209.87	22,997,803.59
*in Megatonnes		22.86 Mt	22.99Mt

Response to Hypothesis: General Findings

1. There is a significant difference in C stocks in standing trees between the three vegetation zones.
2. There is a significant difference in C stocks in undertsorey herbaceous vegetation between the two locations sampled.
3. There is a significant difference in C stock in litter as a factor of the interaction between vegetation and location.
4. The belowground C stocks in the peat soil is largely higher than all the aboveground C stocks, even the combination of all.

Caimpugan peatland is a C sink at present conditions.

Conclusion

- With 22.86 - 22.99 million tons of stored carbon, Caimpugan peatdome is a space efficient C store as compared to other forest ecosystems in the Philippines.
- The most significant C pool in the system is the peat soil since its C storage estimates are exceptionally higher than any of the aboveground pools combined.
- The role of Caimpugan peatland is a net C sink, mitigating climate change.
- Indeed, human activities around Caimpugan peatdome matter to keeping the ecological integrity of the peatland as it presently serves as a significant C sink, mitigating climate change as an ecosystem.

Challenges

- Conservation priority concerns for the peatland should primarily be given to the protection of peat soils. This requires reassessment of present and proposed activities to ensure peatland integrity as C sink.
- Revertion of A and D lands within the Protected Area jurisdiction into strict protection zone.
- Fragility of the system to become C source.


Pygmy Forest, central portion of the Caimpugan
Peatdome


I won't be included in the picture anyway.
Thank you for your attention.