Degraded Peatland Management Option in Central Kalimantan, Indonesia

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Introduction

Source of picture: Asia Pacific Resources International Holdings Ltd

- Indonesia is the major contributor of peatlands areas in the tropics
- Currently, peatlands area in Indonesia was about 14.91 million ha

Unsustainable practices was noticed to be intermediate stages toward further degradation

- Source of CO_2 emission,
- Prone to fire and thus creating haze and emission problems

Peatlands degradation in Indonesia

- 4.4 million ha of peatlands in Indonesia are categorized as degraded.
- This degraded peatlands is a significant source of CO_2 emissions
- CO_2 emissions is feared to increase due to peatlands decomposition (and peat fires) as peatlands forests are drained for others purposes.

Prospective Peatland Agriculture

In General Marginally Suitable

Total Peatland area :
14.9 million hectares

Suitable for Agriculture :
6 million hectares

Debate on Peatlands Management

Conservation

Biodiversity, carbon and water storage

Agriculture

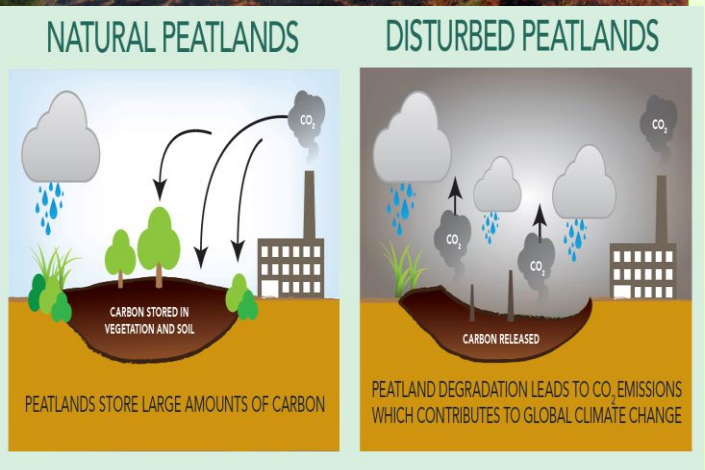
Fulfilled many human needs including :

food, energy, construction material,

Wise use of Peatlands

How to manage degraded peatlands to improve farmer welfare by avoiding the negative impacts on the natural resources especially CO_2 emission

Problem Statement



- Peatlands Degradation

  1.1 million ha of the total 2.6 million ha peatlands in Central Kalimantan Province is categorized as degraded

- Problem of Degraded peatlands:

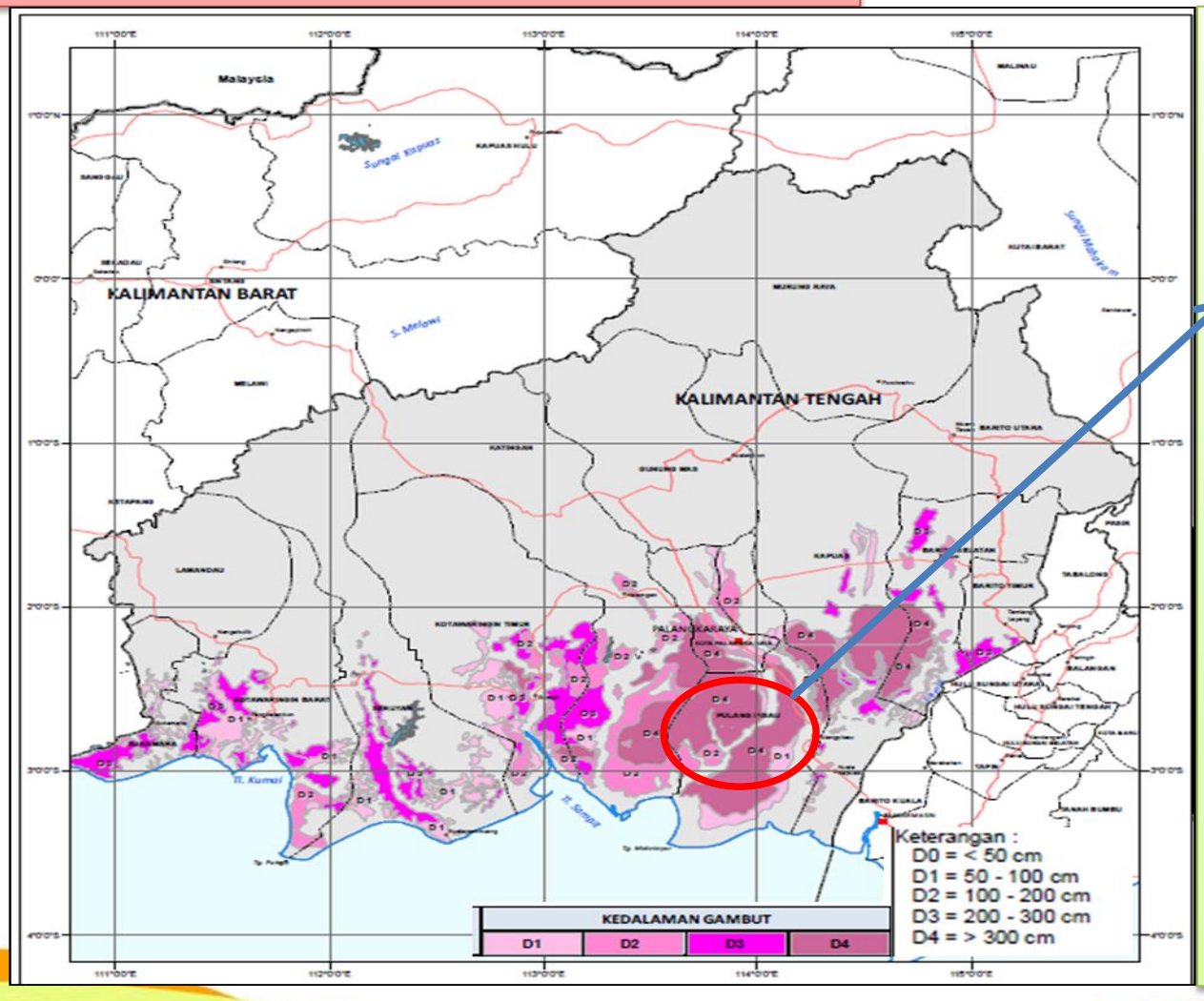
  Source of GHG emission (CO_2)

- Opportunity:

  Forest Rehabilitation, Sustainable Peatlands Agriculture.

Methodology

Selection of Study Area:



- Mantangai Sub distric, Dadahup Sub district in Kapuas district and Jabiren Sub District in Pulang Pisau district are selected as study area
- Rice, Oil palm and Rubber farming system are evaluated as existing farming system

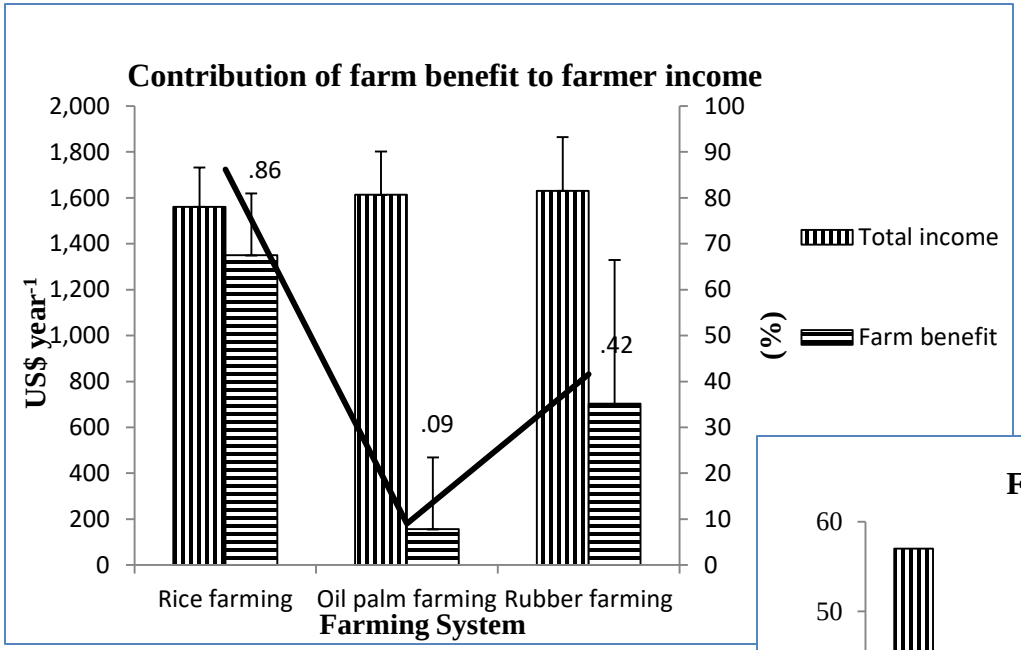
Methodology

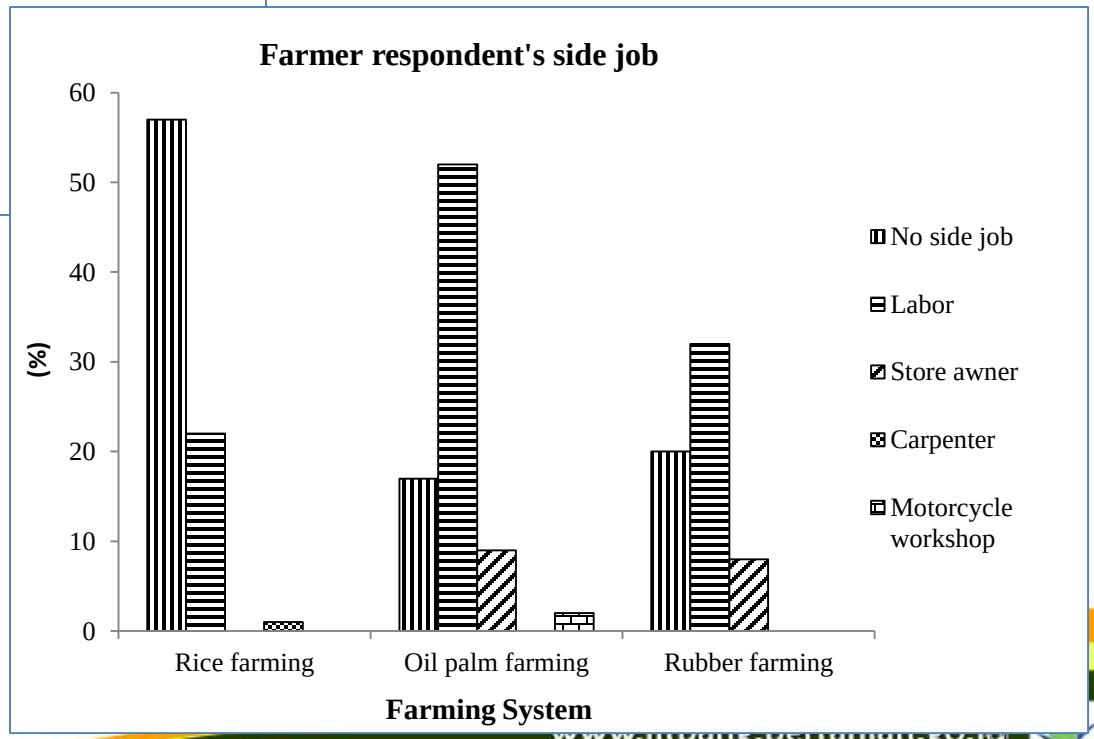
- Farmer household survey with structured questionnaire was done to characterize the household condition in their farming system and livelihood
- A system dynamic model with Stella is used to simulate sustainable peatlands agriculture for improving farmer income and mitigating GHG emission.

Existing Farming System Condition

Variable	Farming System			
	Rice		Oil Palm	Rubber
	Rainy season	Dry season		
Yield (tonne.ha^{-1})	2.13	1.89	8.73	1.571
Price/unit (US$.kg^{-1})	0.35	0.42	0.08	0.54
Production value (US$.ha^{-1})	745.50	793.80	727.21	848.34
Production cost (US$.ha^{-1})	299	286.61	260.70	345.04
Benefit (US$.ha^{-1})	446.50	507.19	466.51	503.3
B/C ratio	1.49	1.77	1.79	1.46

Existing Farming System Condition





Model Development

Data source and assumption based on FGD

- Degraded peatlands map developed by IAARD is used as a basis for exploring land use and land cover changes.
- These degraded peatlands were simulated to compare Business-As-Usual (BAU) condition with the managed degraded peatlands option

Existing condition	Total Area (million ha)	Future Land Use Option
Degraded peatland with peat depth < 2 m	0.33	Rice field (0.16 million ha) or oil palm plantation or rubber plantation
Degraded peatland with peat depth 2 – 3 m	0.20	Agroforestry
Degraded peatland with peat depth > 3 m	0.43	Reforestation
Former mining area	0.04	Reforestation

Scenario reducing deforestation:
I : 0%
II : 50%
III : 100%

Business-As-Usual (BAU) condition, (-1.4% year^{-1}; Miettinen et al. 2012).

Model Development

Data source and assumption based on FGD

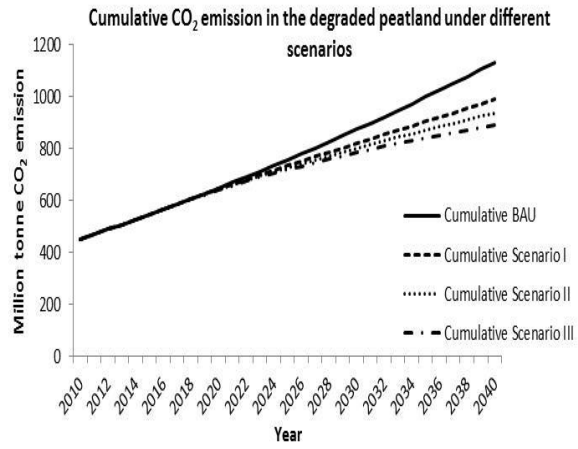
- The amount of CO_2 emissions used in this model is based on estimated CO_2 emissions factor from land use and land use change by IPCC (2014), Hergoualc'h & Verchot (2014) and Couwenberg (2011).:

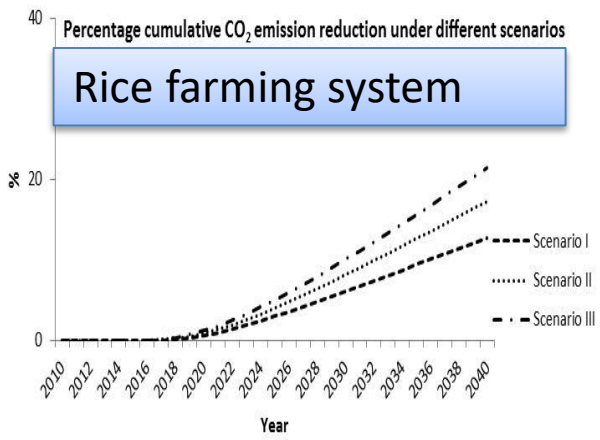
CO_2 emission = A * EF

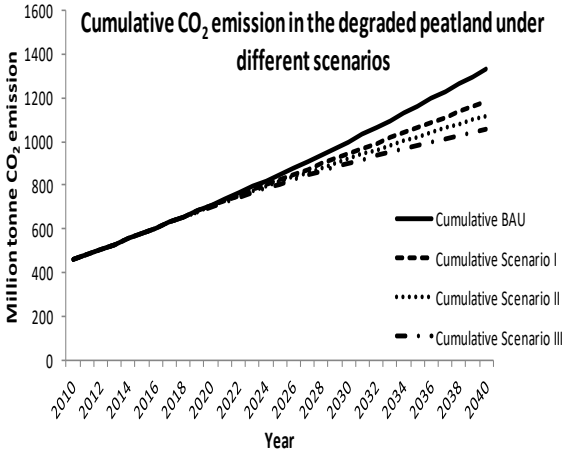
Where A : Peatlands area (ha)

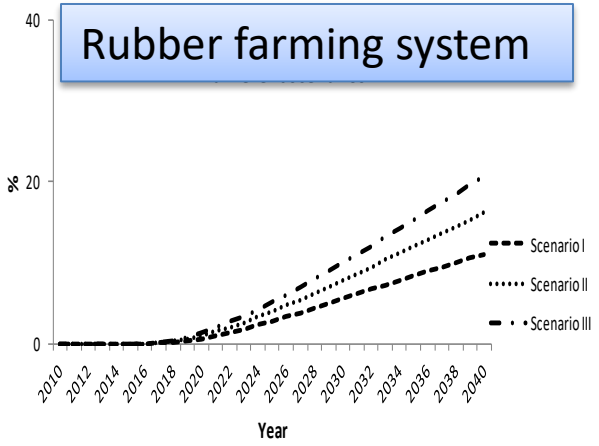
EF : CO_2 emission factor (t CO_2 ha^{-1} yr^{-1})

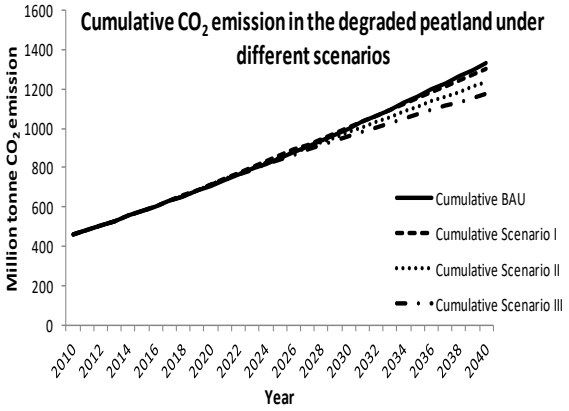
Land Use	Emission Factor (tonnes CO_2 ha^{-1} yr^{-1})	Sources
Natural Peat Forest (un-drained)	0	IPCC (2014)
Degraded Peat Forest	19.6	Hergoualc'h & Verchot (2014)
Agroforestry	11	Couwenberg, (2011)
Oil Palm Plantation	18	Couwenberg and Hooijer (2013)
Rubber Plantation	11	Couwenberg, (2011)
Rice Farm	9	IPCC (2014)

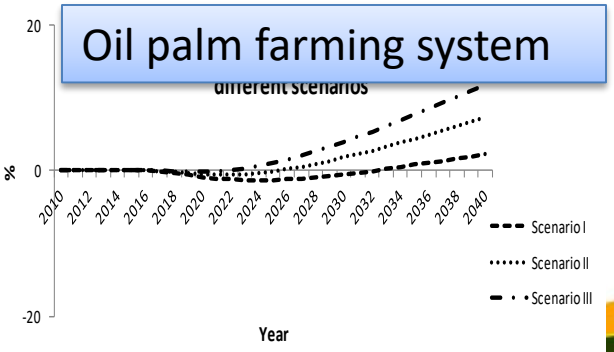












CO_2 emission reduction from BAU

Rice farming system:
Scenario I reduces 12.68%;
Scenario II reduces 17.30 %;
Scenario III reduces 21.42%

Rubber farming system:
Scenario I reduces 11.11%;
Scenario II reduces 16.17%;
Scenario III reduces 20.68%

Oil palm farming system:
Scenario I reduces 2.27%;
Scenario II reduces 7.33%;
Scenario III reduces11.84%

Farmer income improvement

Model simulated in increasing of farmer income:

- Rice farming: 15.9%
- Oil palm: 76%
- Rubber: 16%

Discussion

- Oil palm has highest B/C ratio value followed by rice and rubber farming system with 1.79, 1.77, and 1.46,
- Oil palm plantation also offers highest percentage of increasing farmer income
- However, oil palm has lowest sustainability score compared with rice and rubber farming system (Surahman et al, 2017) and
- The oil palm will be profitable only in the short term and when the externalities of oil palm production, i.e., the costs of CO_2 emissions, are not considered (Sumarga, et al, 2017)
- Among the three farming systems, rice farming offers more reduction in CO_2 emission from the peatlands.
- Wise decision should be applied based on the advantages and disadvantages of those three farming systems.

Conclussion

- These findings illustrate that the option of degraded peatland management in Central Kalimantan should consider with:
  - reforestation of degraded peatlands and
  - using degraded peatlands for crops that offer more reduction in CO_2 emission

Thank You

Terima Kasih