CO$_2$ EMISSIONS FROM DEFORESTATION AND AGRICULTURAL SYSTEMS ON PEATLAND

World Agroforestry Centre
TRANSFORMING LIVES AND LANDSCAPES

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Special auger to collect uncompacted samples of peat

Indonesia has about 20 million ha peatland containing about 37,000 Mt below ground carbon. The peatland forests are under tremendous pressure from agriculture/silviculture development and logging. Over the period of 1985 to 2000 peatlands were deforested at a rate of 1.3% (about 260,000 ha) per year.

Increases in CO$_2$ emission from peatland are usually preceded by deforestation and peatland fires. Subsequent land management systems determine the rate of emission post deforestation phase.

This poster demonstrates estimation of CO$_2$ emissions during deforestation and under different agricultural systems to show their relative importance.

150 to 200 t C/ha

20-130 kg C/m3
~60 kg C/m3
~6 t C/ha/cm

During deforestation, half (about 100 t/ha) of the above ground C is emitted releasing 367 t CO$_2$/ha.

About 10 cm peat is also burned, releasing 10cm*6tC/ha/cm* 3.67CO2/C = 220 t CO$_2$/ha.

Drainage lowers the water table and dries the peat. Dry peat easily decomposes and burns. About 9.1 t CO$_2$ /ha is emitted every year for every 10 cm drainage depth.

Lowland rice, maize/vegetables, rubber, oil palm, and sago palm usually require drainage of about 10, 20, 20, 80 and 0 cm, respectively.

Some traditional agricultural practices deliberately burn peat to increase soil fertility.

The 'Sonor' rice based slash and burn system in South Sumatra slashes and burns at least 10 cm peat/4 yr releasing 55 t CO$_2$/yr.
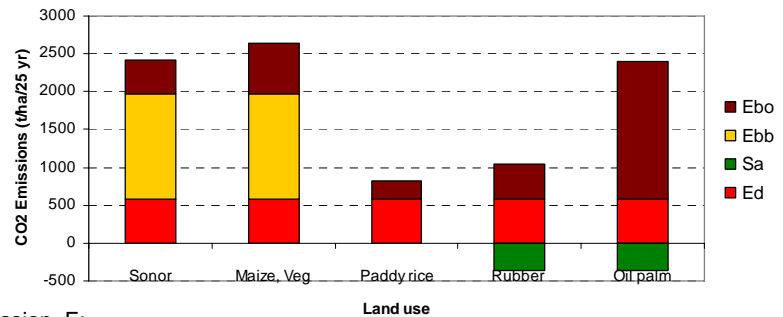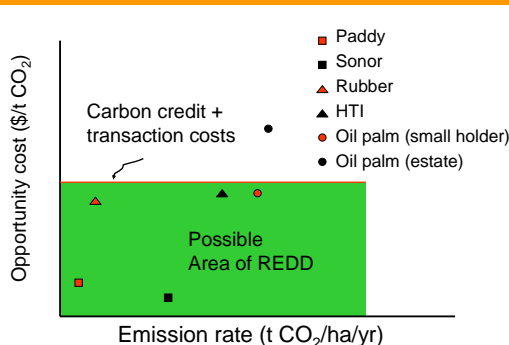

Net emission, E:

$$E = (Ed - Sa) + (Ebb + Ebo)$$

Ed = Emission from above ground (AG) biomass burning and below ground (BG) peat burning during deforestation,
Sa = Sequestration in the above-ground biomass,
Ebb = Emission from below ground peat burning (Vol burned*C density), and
Ebo = Emission from below ground oxidation

Analysis of the relationship between opportunity costs and emission rates for major farming systems will be useful in negotiations for a carbon trading scheme through Reducing Emissions from Deforestation and Degradation (REDD).

CO$_2$ emission, annual profit and opportunity costs

Farming system	CO$_2$ emission	Income	Opportunity cost
	t/(ha yr)	$/(ha yr)	$/t CO$_2$-e
Sonor (South Sumatra)	97	8	0.08
Oil palm (Jambi)	82	146	1.79
Oil palm (Pesisir Selatan, West Sumatra)	82	360	4.41

- For oil palm plantation and annual crop systems involving burning, the amount of emissions per unit area per 25 years (one cycle of oil palm plantation) is several times higher than that during deforestation.
- The opportunity costs as shown are lower than the certified emission reduction price of $5/t CO$_2$ – likely applicable in REDD . Opportunity costs of more efficient systems may exceed the $5 value.
- Reducing emissions from peatland deforestation and degradation through payment transfer should be seriously considered in the next round of the climate change debate.