ASB Partnership for the Tropical Forest Margins

Policybriefs

10

THE OPPORTUNITY COSTS OF AVOIDING EMISSIONS FROM DEFORESTATION

How valuable are the economic opportunities that farmers give up to reduce emissions from deforestation?

A bottom-up perspective helps clarify how to design incentives to change behaviour at ground level

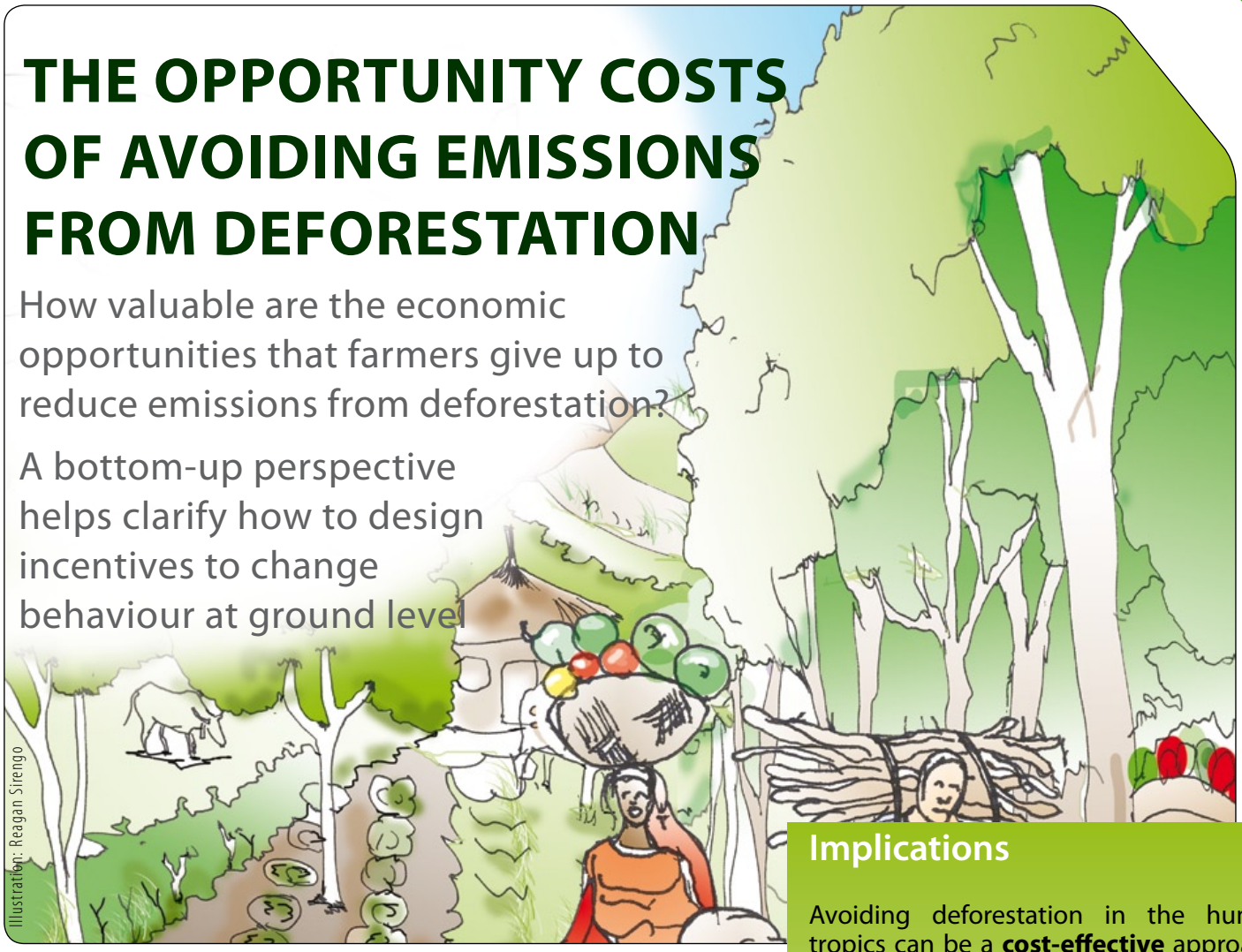


Illustration: Reagan Sirengo

Key Findings

1. Land use systems in the humid tropics bring diverse environmental and social benefits, storing different quantities of carbon and generating different income for land users.

2. Land use change in the humid tropics is complex, but largely driven by land users seeking to increase economic returns. An array of land use changes occur in most landscapes, some of which sequester carbon, others which emit carbon, almost all of which generate increases in income for individual land users.

3. Most deforestation generates relatively small economic benefits for the damage caused. Across most of the study sites, 80 percent of land users earned less than USD $5 in revenue per tonne of carbon dioxide equivalent lost due to land use change. This opportunity cost is low relative to prices on most carbon markets.

4. Converting peat forests generates very low economic returns and exceptionally high emissions. Conversion of peat forests, which store large amounts of carbon in the soil, generates only $0.10 – $2 per tonne of CO_2 emitted.

Implications

Avoiding deforestation in the humid tropics can be a **cost-effective** approach for large reductions in CO_2 emissions

Carbon emissions from land use changes could be reduced **if farmers considered carbon values in their economic decision making.**

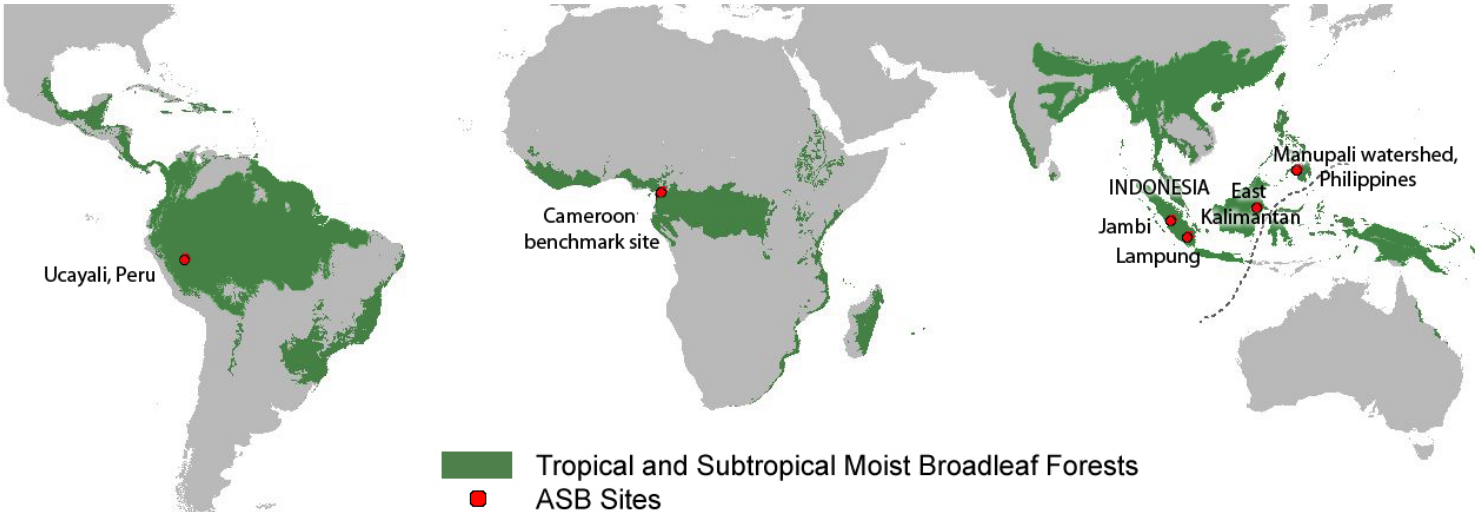
International carbon finance is only one of several options for influencing incentives of people making land use decisions that emit and sequester carbon.

Urgent attention should be given to **reducing emissions from the peatlands of Southeast Asia**

This retrospective analysis of the actual opportunity costs of avoiding emissions from deforestation under-states the full costs that would be involved in implementing a REDD programme.

Reducing emissions through avoided deforestation has emerged as an important option for mitigating climate change and helping conserve natural resources. It is also discussed as a potential means to provide income to local communities [see ASB PolicyBrief 11 – Pathways for High-Carbon Rural Development]. The few studies that have recently evaluated the potential for reduced emissions from deforestation have reached very different conclusions about likely costs. These studies have been very coarse, often applying global forest models that aggregate the tropics into very large blocks, far removed from the realities of farmers – the ultimate land managers.

The ASB Partnership for the Tropical Forest Margins has produced methods and data sets invaluable for understanding the tradeoffs associated with alternative land uses across the humid tropics (Tomich et al., 1998). A recent study by Swallow et al. (2007) builds upon this knowledge base to examine the opportunity costs of avoided deforestation to land users, that is, the cost of forgoing current land use practices in favour of higher-carbon land-use practices. This analysis takes a bottom-up retrospective approach. The results help clarify how to design an appropriate financial or policy incentive to change behaviour at ground level.



Methods

The research builds on past ASB methods and assessment of the economic returns (NPV) and carbon stocks associated with alternative land uses.

1. Medium-density satellite imagery is used to characterize land use and land-use change between 1990 and 2005
2. Researchers combined data from different sources to conduct a pixel-by-pixel analysis of current land use, land use change, change in time-averaged carbon, and change in the net present value
3. This data was aggregated across the landscape for all carbon-emitting land use changes, to produce estimates of the magnitude of carbon-sequestering and carbon emitting land use changes as well as an opportunity cost curve

Key Terms

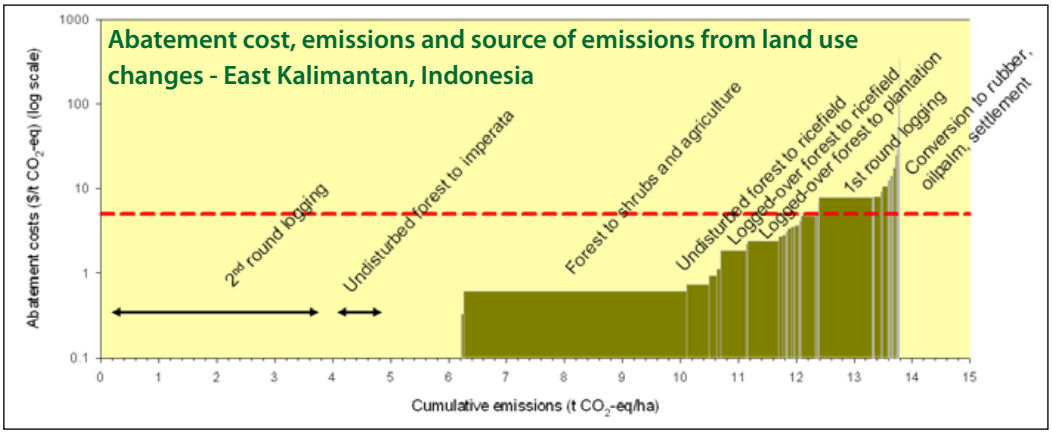
Net Present Value (NPV) measures the profitability of a land use, considering all costs and revenue streams over its lifetime, subject to discounting at the local private interest rate.

Time-Averaged Carbon Stocks measures the average carbon stored by a land-use system, taking into account the carbon losses and gains that systems experience over their different life-cycles (see Woomer et al., 2000, Palm et al., 2005).

CO_2 equivalent (CO_2 eq) describes a unit of greenhouse gas emissions in terms of carbon dioxide equivalents.

1. Land use systems in the humid tropics storing different quantities of carbon and generating different income for land users

The variety of land uses between forest and farm is significant in the tropics. This research, conducted at sites in Indonesia, Peru, Cameroon and the Philippines, finds that each land use type has different ecological and economic characteristics, storing different quantities of carbon and generating different income for land users. Many agroforestry-based intermediate land uses, which mix tree crops with other forms of agriculture, can store significant amounts of carbon and also offer good economic returns to farmers. The balance of carbon and livelihoods depends on the incentives that farmers face.



This figure shows two emitting land use changes in East Kalimantan that generated negative economic returns: second round logging and degradation of undisturbed forest into imperata grassland. This is evidence of high-grading: timber extraction for short-term gain with little consideration for the long-term consequences.

2. Land use change in the humid tropics is complex, but largely driven by land users seeking to increase economic returns

Forest transitions in the tropics range from traditional shifting cultivation to intensive continuous cropping, and are driven by a range of direct and indirect factors (1). Some of land use changes sequester carbon, while others emit carbon. Examples from the Philippines of carbon emitting land use changes include conversion of forest to mixed agriculture, agroforest to coffee, and agroforest to sugarcane. Examples of carbon sequestering land use transitions include ricefield to agroforest, shrub to agroforest, and mixed agriculture to coffee (2).

Overall, however, much more carbon has been lost in land-use transitions. This is exemplified by the Indonesian province of East Kalimantan, where land use changes resulted in an average of 230 tonnes per hectare per in the year that they occurred, while shifts from lower to higher carbon-sequestering land uses resulted in just 4 tonnes of sequestration per hectare per year (3).

Nearly all of the emitting land-use changes observed were privately economically rational, meaning they generated some increase in income for the land user. However, these profits were gained at a very high social cost – the global community loses when tropical forests are destroyed. Land use changes associated with deforestation do not greatly benefit poor local farmers and can contribute to permanent environmental degradation.

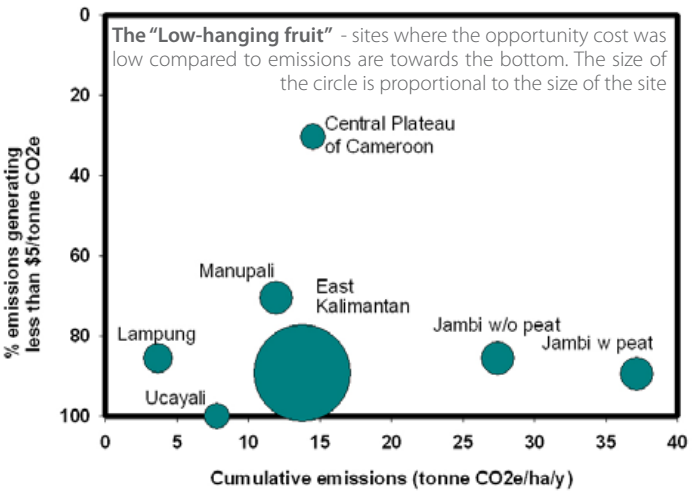
3. Most deforestation generates relatively small economic benefits for the damage caused

Across most of the sites, 80 percent of land users earned less than $5 in revenue per tonne of carbon lost due to land use change. Expressed in terms of tonnes of emissions of carbon dioxide equivalents (CO2eq) the economic gains associated with deforestation are very low.

For example, in the three Indonesian sites, between 6-20% of the area where emissions increased have generated returns less than $1 per tonne of CO2eq and between 64-92% of the emissions generating changes have resulted in returns less than $5 per tonne of CO2eq. In the site in Ucayali Province in Peru, over 90% of emissions from land use change generated returns less than $5 per tonne of CO2eq. If the value of the carbon stock of standing forests had been considered by those farmers during the last 20 years, a large percentage of greenhouse emissions from deforestation in the Indonesia and Peru sites might have been avoided. Current market and incentive conditions in the humid tropics continue to favour deforestation, despite the high social cost.

4. Converting peat forests generates very low economic returns and exceptionally high emissions

Peat forests and other peatlands ecosystems are very rich in carbon, both above and below ground (Hooijer et al., 2006). But when peatlands are drained or burned, their large carbon stocks lead to massive CO_2 emissions, releasing what took thousands of years to accumulate. Results from Jambi, Indonesia, show that peatlands generate especially low economic returns per tonne of CO_2 emitted, as low as US$0.10-0.20 per tonne of CO_2 emitted. Emissions from peatlands constituted a significant proportion of emissions in Jambi and many parts of Indonesia, yet peatlands are not counted under current UNFCCC rules.



Implications

Avoided deforestation can be cost effective

Although the potential for mitigation varies from site to site, every year of delayed action means a year more of large emissions that could have been avoided at relatively little cost to the world economy. Governments and other stakeholders should take positive steps to realizing this opportunity as they continue to negotiate how to incorporate REDD into new long-term agreements.

The right mix of incentives

Carbon finance is only one of many policy options and incentives to change land use decisions. Selecting the right mix of incentives will depend on what policies and processes are driving land use change. Avoided deforestation strategies can include eliminating perverse incentives by changing input subsidizes, land titling sytems, forest governance arrangements and taxation regimes. Positive incentives can also be implemented to directly or indirectly change drivers of deforestation, including strengthening property rights.

Valuing forest carbon could reduce emissions

Land users make rational economic decisions about whether to deforest or convert land. Carbon emissions from land use changes could be reduced if farmers considered carbon values in their economic decision making. In the absence of incentives for landowners to maintain forest resources, market conditions will continue to generally favour conversion of forests over conservation.

Photo: P.Minang

Pay urgent attention to the peatlands of Southeast Asia

Policy makers concerned about carbon emissions can and should harvest some 'low hanging fruit' by devising early and effective mechanisms for compensating land users for the carbon storage value of forests and trees. In particular, urgent attention should be given to reducing emissions from the peatlands of Southeast Asia. This includes stopping conversion of peat forests and modifying farming practices on previously converted peatlands, mostly by reducing the depth of drainage. Current negotiations about Reduced Emissions from Deforestation and Forest Degradation (REDD) should cover not just forested peatlands, but all peatlands.

Opportunity costs are an important piece of the puzzle

Opportunity costs do not represent the full cost of implementing REDD programmes. The full cost of REDD will depend on many factors including targeting efficiency, program costs and commodity prices. However, an understanding of the opportunity costs of avoiding deforestation can help policymakers design appropriate mechanisms that influence land-use decision-making at the ground level, where it matters most.

The ASB Partnership for the Tropical Forest Margins is working to raise productivity and income of rural households in the humid tropics without increasing deforestation or undermining essential environmental services. ASB is a consortium of over 90 international and national-level partners with an ecoregional focus on the forest-agriculture margins in the humid tropics, with benchmark sites in the western Amazon basin of Brazil and Peru, the Congo Basin forest in Cameroon, southern Philippines, northern Thailand, and the island of Sumatra in Indonesia.

This document is based on over a decade of research on the tradeoffs between environmental services and livelihoods by ASB, ICRAF and its partners. This policybrief distils the key lessons from the 2007 ASB Interim Report: ***The Opportunity Costs of Avoided Deforestation with Sustainable Benefits***. The ASB Policybriefs series aims to deliver relevant, concise reading to key people whose decisions will make a difference to poverty reduction and environmental protection in the humid tropics.

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