



Policybriefs

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HIGHLIGHTS

Examining the evidence

The roots of the problem

No quick fix

Shifting cultivation for subsistence food production is seldom the main cause of tropical deforestation. Other forms of agricultural expansion—practised by smallholders and large landowners alike—tend to be much more important. But the most significant determinant of all is how these land uses interact with and are affected by macro-economic forces, access to markets and a host of other policy and institutional factors.

DEFORESTATION has no single cause but is the outcome of a web of factors whose mix varies greatly in time and space. Understanding which factors are at work in a given situation is a crucial first step if policymakers are to intervene successfully to curb deforestation.



T. Tomich

Roads are key factors for integration and market expansion for livestock and other products, making forest conversion more profitable.

Examining the evidence

People are confused about the causes of tropical deforestation. Many studies of deforestation have been too simplistic, coming up with a single issue, such as population growth, as 'the explanation'. Attempts to gain a comprehensive picture by evaluating and comparing evidence from a large set of locations have been rare. And there has been no logical way of classifying the causes for the purposes of analysis.

A recent review has gone a long way towards overcoming these limitations. Helmut Geist and Eric Lambin (2002) examined and compared the factors at work in 152 cases of tropical deforestation in Africa, Asia and Latin America. The authors base their analysis on a distinction between the *proximate causes* of deforestation—human activities on the ground at local level—and the larger *underlying causes* or *driving forces* that explain these activities. This is an advance on previous thinking because it recognises that the people in the front line of deforestation—those wielding the chain-saws or driving the bulldozers—do not make their

decisions in a vacuum but are strongly influenced by macroeconomic and social factors operating at the regional, national or global level over which they have little control.

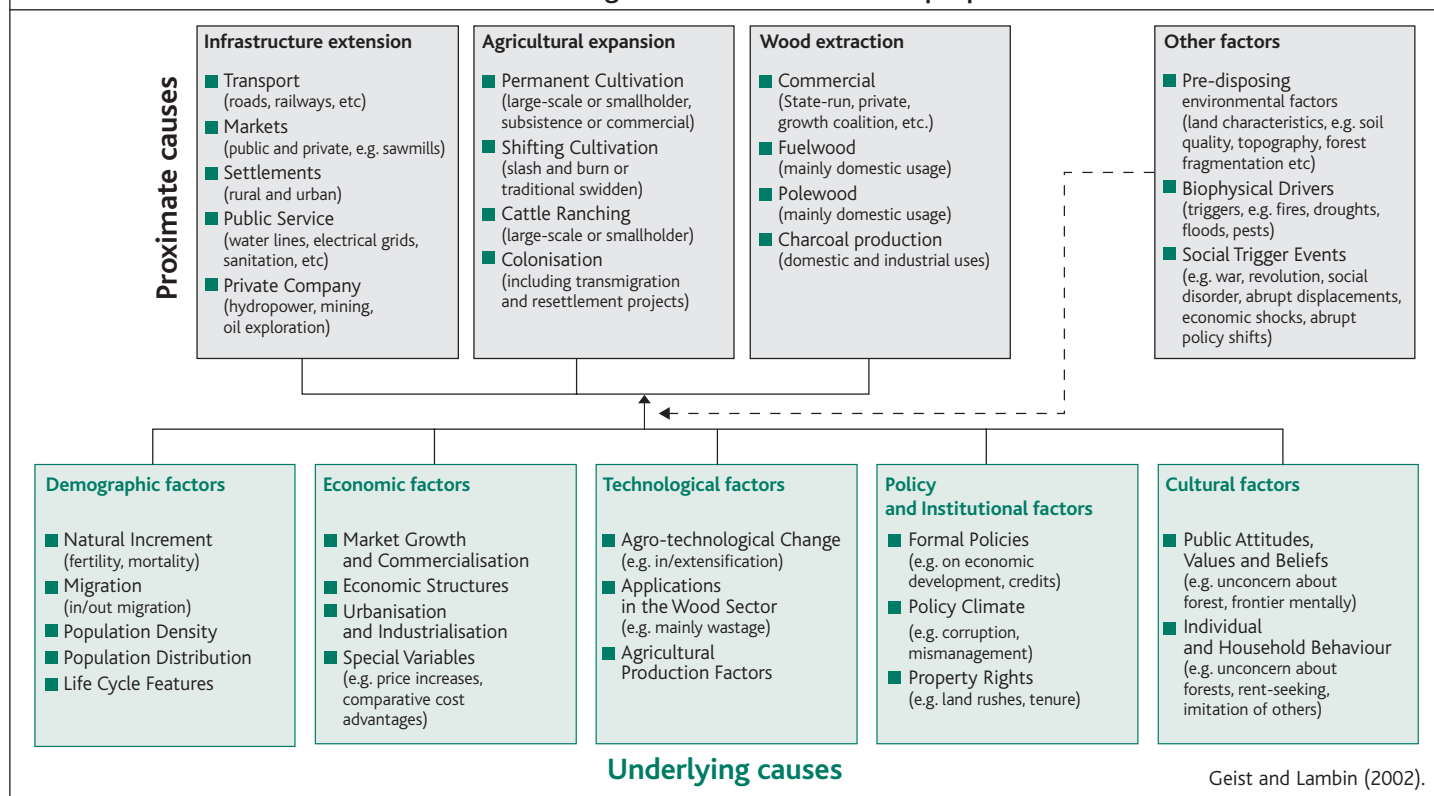
Using this distinction, Geist and Lambin propose an analytical framework in which four broad clusters of proximate causes—agricultural expansion, wood extraction, infrastructure development and 'other'—are linked to five clusters of underlying causes—demographic, economic, technological, policy and institutional, and cultural.

In each case, the clusters are subdivided to be more specific. For example, their agricultural expansion cluster is divided into permanent cultivation, shifting cultivation, cattle ranching or colonisation.

A mix of causes is normally at work when deforestation occurs. The review goes on to identify what it calls 'causal synergies'—associations of proximate and underlying causes that help to explain complex processes of deforestation more accurately than previous 'single-factor' explanations.

A Framework for Understanding Deforestation

Five broad clusters of driving forces lie behind the multiple proximate causes



The roots of the problem

The review by Geist and Lambin tells us much about the complicated causes of tropical deforestation. Its general findings are in line with those of the location-specific studies conducted by ASB and its partners in the Western Amazon, the Congo Basin and Southeast Asia (see boxes on pp. 3 and 4).

One important finding is that shifting cultivation of foodcrops by smallholders for subsistence purposes, so often thought to be a major cause, is in most cases a relatively minor contributor. Depending on the region, other forms of agricultural expansion, such as permanent cropping or cattle ranching, appear equally or more significant.

Far more important than identifying any single proximate cause of deforestation is understanding the relationship between these causes and the underlying macroeconomic forces that create the incentives to which individuals respond. These macroeconomic forces often are perceived as shocks that destabilise the lives of poor people—for example, a sudden

currency devaluation that alters the relative prices of cash crops and foodcrops, or a massive increase in urban unemployment, triggering reverse migration into the countryside. However, these short to medium-term shocks or cycles merely punctuate the longer-term social and economic trends that bring about more gradual changes in the opportunities available to poor rural people—such as world income and population increase, globalisation and growth of international commodity trade, the expanding economic ‘footprint’ of distant city markets and the developing cash economy.

The influence of macroeconomic forces is amplified by the building of roads. Whether part of regional development planning or paid for by logging companies or other private sources, new roads open up forest areas for logging and for the expansion of agriculture. New migrants colonise roadsides, and roads enable them to obtain inputs and deliver their produce to markets at lower cost. By linking forested areas to the broader economy, roads heighten the sensitivity of these areas to changes in macroeconomic conditions, whether these occur as short-term shocks or long-term trends.

Cameroon is the only ASB case study country in which shifting cultivation of foodcrops for subsistence appears as a dominant proximate cause of deforestation. Yet even here, macroeconomic policies and economic trends are intimately linked to the direction of change. Cameroon provides a textbook case of how economic signals alter the attractiveness of different cropping systems to small-scale farmers, with major implications for deforestation rates.

The Cameroon case reveals how some of the effects of macroeconomic forces are expressed through the responses of thousands of small-scale farmers. But it also shows how these forces can affect the pace and location of deforestation, rather than whether or not it happens at all. In other words, changes in macroeconomic conditions may merely replace one proximate cause of deforestation by another.

Pressures on the forest exerted by smallholders may be temporarily reduced in times of rapid economic growth, when poor rural people migrate to the cities. But such growth also contributes to the wealth that enables urban capitalists to invest in agriculture—adding pressure from a growing class of absentee commercial

Brazil: Macroeconomics, road building and inter-regional innovation in agriculture

Logging, cropping and ranching are often identified as the proximate causes of deforestation in the Brazilian Amazon. However, the deforestation process in the Amazon is driven by multiple, interacting underlying causes. Understanding deforestation in the Brazilian Amazon requires consideration of local, regional and national processes, and how these relationships interact and evolve over time.

Transport costs have a fundamental impact on the profitability of agricultural options in the Amazon and, hence, on land values. The Brazilian government's plan to pave approximately 6,000 kilometres of highways cutting through the core of the Amazon is predicted to

lead to an additional deforestation of 160,000 to 240,000 square kilometres over the next two to three decades.

Further, since agricultural activities throughout Brazil are competing for labour, capital and land, the relative speed of innovation in different sectors and regions will matter. If innovation in the livestock sector outside the Amazon cannot maintain the pace of innovation in annual crops such as soy in those regions, a surge in deforestation can result as livestock production is displaced into the Amazon. ASB research highlights how productivity improvements, whether driven by economy-wide policies or by public investment in agricultural research, have a substantial impact on both

agricultural incomes and future deforestation in the Brazilian Amazon.

At the macro scale, ASB researchers have demonstrated that exchange rates have an important impact on deforestation. This research indicated that a 40% real devaluation of the Brazilian Real against the US dollar would lead to increases in deforestation of up to 6% in the short term and 20% in the long term, with an increase in logging of 16–20%; these simulation results are in line with recent events. The process works like this: when a devaluation causes regions with better international market access to switch to export crops, production of livestock in the Amazon grows to meet domestic demand for beef.

farmers or plantation owners. In Indonesia, decades of economic growth, exploitation of natural resource wealth and subsidised loans culminated in a boom during the early to mid-1990s and created a powerful class of large-scale land operators whose interests clashed with those of smallholders.

The 1997 collapse of Indonesia's currency made conversion of forest land to production of export tree crops such as oil palm, rubber, cocoa and coffee even more attractive.

Added to the complex set of macroeconomic forces in any given region are a host

of institutional, technological and other policy-related factors that combine with broad social and economic trends to affect deforestation rates. This category includes regional land use plans and development programmes, colonisation schemes, agricultural subsidies and land tenure problems.

Cameroon: Shocks and trends

From 1977 to 1985 Cameroon enjoyed an export-led boom based on petroleum, coffee and cocoa. This boom was followed by an abrupt decline in the second half of the 1980s, as the country's oil ran out and the international prices of all three of its main export commodities slumped. In 1989 shrinking export revenues forced the government to stop subsidising agricultural inputs and to halve the prices of coffee and cocoa offered to farmers. These measures were followed, in the early 1990s, by draconian cuts in public-sector employment and wages. Finally, Cameroon's currency was devalued in 1994.

These economic shocks had a dramatic

effect on Cameroon's rural areas.

Analysis of satellite images shows that, in 1986–96, annual deforestation doubled over its 1973–86 level in areas close to the capital city and quadrupled in more remote, thickly forested areas.

As the crisis deepened, rural–urban migration first slowed then went into reverse, as impoverished city dwellers returned to the countryside to take up farming. A sample of rural villages from the humid forest zone showed that the population of these villages grew by only 1.6% in the 1976–87 period, but by a massive 24% in 1987–97. Most of the 'returnees' put their efforts into growing food crops, first to ensure family food security and then to sell on local

markets. Existing farmers also grew more food crops, while maintaining or expanding their area in tree crops in the hope that high prices would return. The expansion of food crops, which was more pronounced in remote, thickly forested areas, greatly accelerated deforestation.

Four other factors in the larger economy drove the expansion of food cropping: food imports declined during the crisis; more flexibility in the gender division of labour, in response to the crisis, allowed an increase in labour inputs; the phasing out of subsidies for inputs forced farmers to cultivate larger areas to maintain production; and logging, which clears the way for food and cash crops, accelerated following the 1994 currency devaluation.

The latter is particularly important when land becomes scarce, as in the Sumatran case (see box below).

Lastly, deforestation has often been attributed to population growth per se—the growth resulting from human fertility. But the Geist and Lambin review and the three ASB case studies indicate that migration is more important.

Indonesia: Jostling for profits

ASB's case studies on the Indonesian island of Sumatra revealed a mix of large- and small-scale producers jostling for land. Successive waves of migrants have penetrated further and further into the island in a process of migration from neighbouring Java that has taken place over many decades. Moreover, many native Sumatran smallholders were displaced by the large-scale plantations, timber estates and concessions established by public or private projects, particularly in the 1970s and 1980s. The mixture of these different groups of land users, migrant and native, large-scale and small, has proved highly combustible, often leading to violence—as 'squatters'

No quick fix

If the development community is to get serious about slowing deforestation, it must pay more attention to the powerful macroeconomic forces that combine with the institutional and policy environment to induce people to clear more forest land.

are driven off land they may have farmed for generations—and to the burning of plantations in revenge for such land grabs. In such situations, land tenure insecurity can become an important factor in deforestation. Planting tree crops is a recognised way of claiming land in Indonesia, and tenure claims contribute to the extensive nature of smallholder farming. The appropriation of large tracts of land for public or private projects fuels smallholders' perceptions of tenure insecurity. In this way, the expectation of new projects can accelerate forest conversion as a pre-emptive strategy for retaining local control of the land.

At present, these forces often simply swamp local conservation efforts: the area of forest cleared by successive waves of migrants, whose arrival is driven by the lack of opportunities elsewhere and facilitated by the building of roads, vastly exceeds the area 'saved' by projects focusing on sustainable forest use by individual farms or villages. A major weakness of past conservation efforts is that they have routinely limited their activities to technical interventions at the local level while failing to tackle the larger policy and institutional issues that also determine success or failure.

The challenge of preventing deforestation is complicated by the fact that, in most cases, deforestation has no single cause that can be easily identified and tackled. Rather, it results from a combination of different factors. A mix of policies, rather than a single measure, will therefore be needed. And careful identification of the factors at work in a given location will be a prerequisite for getting the mix right while minimising the cost to local peoples' livelihood opportunities and other legitimate development objectives.

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