

POVERTY REDUCTION BY TROPICAL FORESTS?

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Abstract

For 64 tropical countries, the Human Development Index as a national poverty measure is regressed with the relative forest area as a dependent variable, and with population density and six other independent variables. These countries compose 84% of the total tropical forest area. It was found that the adopted poverty variable was strongly correlated with the relative forest area. Based on this it was assumed that high population density at low income levels advances forest degradation, deforestation, and desertification. The deteriorated forest environment as a human habitat increases poverty, which in turn increases population pressure on the remaining forest, and so on in a vicious circle. The prevailing practice of administrative pricing of standing timber undervalues the tropical forest. Therefore, the opportunity cost of sustainable forestry remains too artificially high and is expanding deforestation. Corruption and some other causes lay under the local visible agents of deforestation. In Finland, the increasing exports of forest products have made forestry more profitable for farmers, which for a century composed the majority of forest owners. With this linkage forestry incomes were not only used for consumption, but also invested in raising the productivity in agriculture. This pattern of tenure effectively reduced poverty on a national scale. In the tropics increasing exports have advanced deforestation with minimal impacts on poverty reduction. Most tropical countries are lacking a balanced mix of institutions, policies, and markets to support poverty reduction by forestry. Therefore, poverty reduction by utilizing the tropical forests will remain rhetoric for the time being. It may become a viable option only in at least two decades with a major devolution of the prevailing programmes of social and community forestry and with the eradication of corruption.

Introduction

The United Nations (UN) as the first of eight goals in its Millennium Declaration of September 2000, has declared efforts to halve the number of the extreme poor and the number of people suffering from hunger by 2015. It is recognized that halving poverty and attaining other related goals can be achieved only through a stronger partnership among all the development actors (UNDP 2003, p. 27). Therefore, it is not surprising that attacking poverty has lately become a popular rhetorical goal among inter-governmental organizations (IGOs), non-governmental organizations (NGOs), and national development agencies.

The United Nation Development Programme (UNDP 2003) has contributed to the follow-up of and in constructing instruments for ending human poverty since 1990, when it began publishing its Human Development Index annually. The 2003 report presents a penetrating analysis of how the countries listed on the index compare in achieving the eight Millennium Goals and how to launch improvements.

The concept of poverty has been expanded since 1990. The new forest strategy of the World Bank (2003) sets poverty reduction as one of its three main pillars. The World Bank (2001, 1990) launched its poverty report four years ago as a follow-up to its voluminous poverty report eleven years earlier.

The Asian Development Bank (2001) joined the effort with its poverty reduction agenda. The Food and Agriculture Organisation of the United Nations (FAO) has also adopted an agenda (FAO/DFID 2001) on how forests can reduce poverty, with some later developments (FAO 2003). *Forests in poverty reduction strategies: capturing the potential* (Oksanen et al. 2003) is just one title of a number of seminars and workshops (e.g. Sim et al. 2004) in this field lately.

Finland has only 0.5 percent of the total forest area of the world, but as high as a fifteen percent share of the total value of global forest products exports. The Finnish exports of forest products exhibit some of the highest values both on a per capita basis and on a percentage share basis of the total commodity exports among the eight largest exporting countries of forest products in the world. Forestry and the forest products industry have played a key role in reducing poverty in Finland since the latter half of the 19th Century. Traditionally, farm forestry has played a dominant role in providing the timber supply of Finland. Therefore, timber stumpage markets have been more competitive than in most other countries and consequently, both the stumpage and wage incomes have had more equal geographic and functional distributions than in the other sectors. (Palo & Uusivuori 1999, Palo 2003).

The forest conditions in the tropical world are different from those in Finland in many ways, but it may be worthwhile to contrast the evolution of the Finnish forest cluster and its impact on poverty with those in tropical countries. This comparison follows the idea by John Stuart Mill, the 19th Century British economist and philosopher: by comparing some phenomenon at its minimum and maximum, we may improve our understanding of the phenomenon (Mill 1846).

The seminal paper, *The role of forest industries in the attack on economic underdevelopment* by Jack Westoby (1962) aimed to create welfare/eradicate poverty by developing forestry and forest industries as growth poles for entire economies via a number of linkage effects. This theoretical framework served as guidelines for the FAO's forestry development projects for about 15 to 20 years with weak success (Figure 1, Westoby 1978, Palo 1988). Westoby's theory worked well in Finland (Wardle et al. 2003), but not in the tropics. Why?

This paper is aimed to respond to this most essential question of whether tropical forests can reduce poverty . The purpose here is to describe the global concept of poverty and its linkage with tropical forests at the national level. Finally, some discussion is provided with conclusions.

An underlying hypothesis of this paper is that poverty reduction by tropical forests is perhaps, after all, a new rhetoric or slogan, rather than a viable option, to cover the failures by the IGOs, the NGOs, the various national governments, and the development agencies in slowing down tropical deforestation (Figure 1). Poverty reduction may also be a viable instrument to facilitate more external funding for forestry development projects.

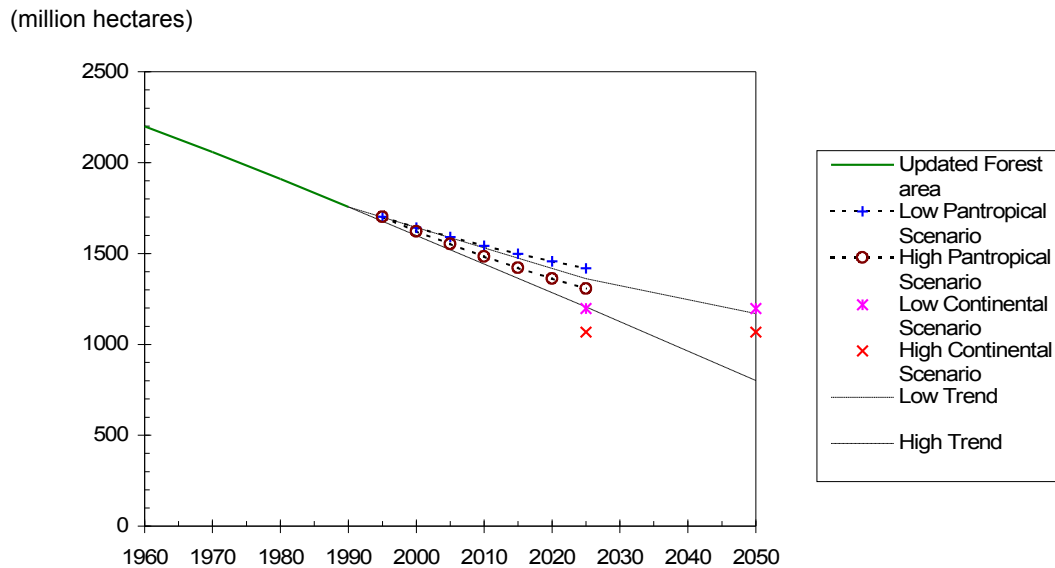


Figure 1. Declining natural forest area in the tropics 1960–2050 (Palo et al. 1999, Palo & Lehto 2000).

This paper is restricted to study the linkages between poverty and different kinds of natural forests, in 64-83 tropical countries, at the national level. The number of countries in each analysis depended on the availability of data. The aim was to cover as many countries and as large a forest area as possible. In fact, in this way we can capture most of the poor people (World Bank 2001) and 84–99% of the total tropical forest area in the world (FAO 2001, Palo & Lehto 2003a). This paper is partially a review of a previous paper by one of the present authors (Palo 2004), but it also introduces further theoretical and empirical evidence to support the stated underlying hypothesis.

Poverty concepts

Poverty can be defined and measured in different ways (Scott 1981). The term income poverty refers to people with low monetary incomes. About 1.2 billion people out of 6 billion live on less than US\$1 a day. A half of all the six billion people on Earth live on less than US\$2 a day. A clear reduction in the number of people living on less than US\$1 a day has lately taken place in East Asia and the Pacific. On the other hand, income

poverty has increased clearly both in Sub-Saharan Africa and in South Asia (World Bank 2001).

Consumption poverty is a somewhat wider term than income poverty. The concept is widened more by including the multiple aspects of nutrition, health, education, empowerment of people, and freedom of choice. Furthermore concepts, like sustainable livelihoods and the five-capital approaches, have been introduced. The latter concept is composed of natural, human, social (political), cultural (physical), and financial capital. A success in poverty reduction is dependant on access to all of these kinds of capital. (Hyden 1998, Smith & Scherr 2002, Angelsen & Wunder 2003). Accordingly, a theoretical deduction can be made, in that for the purpose of poverty reduction, access to forests, as one kind of natural capital, can on its own play a rather limited role.

The World Bank (2001) has adopted a three-dimensional concept of poverty: opportunity, security, and empowerment. Security refers to the risk of people falling below the poverty line or other welfare indicators. Empowerment means access and control over local resources, public services, and influence in local decision-making. Opportunity includes income, education, and health. Therefore it is quite similar to the Human Development Index by the UNDP, which is composed to be a simple average of the life expectancy, education, and Gross Domestic Product (GDP) per capita indexes (UNDP 2003).

Angelsen and Wunder (2003) analysed the varying concepts of poverty. After a multiplicity of concepts they arrived at a definition of poverty as subjective well-being. Their one conclusion was that at the end of the day, what matters is a person's own subjective assessment of his/her well-being. Another conclusion on the different concepts was that ultimately the choice of a poverty indicator is dependent on the research context, goals, budget, duration, and the specific need for comparative analyses.

Accordingly, there exist a number of poverty concepts available for analysis. We are restricted in the best empirical measure, namely "opportunity," based on the meaning given by the World Bank (2001). This is an absolute poverty concept. We shall not use any relative poverty concepts. However, we will make our analysis at the national level. In this way we exclude the subjective and individual or household poverty concepts as well as a number of more multidimensional concepts.

Model specification and data

Tropical deforestation is a complex, dynamic, multisector, and multilevel phenomenon. The visible local actors of direct deforestation, such as colonists, agriculturalists, shifting cultivators, cattle rangers, fuelwood gatherers, industrial loggers, and infrastructure developers, act according to prices, taxes, and subsidies or coercion applied by national or international actors. The real causes of deforestation are underlying these visible local level direct actions. In order to slow down deforestation we have to deal with these underlying causes (Palo 2000, Palo et al. 2000, Uusivuori et al. 2002).

Naturally, the local actors of direct deforestation have their individual motivations and goals that may be called the direct causes of deforestation. Profit maximization and survival are representative examples of such goals. In a simplified way, we may state that tropical deforestation is continuing at a non-decreasing pace (Figure 1), because for economic agents deforestation is more beneficial than maintaining natural forest cover or practicing sustainable forest management. When a low monetary value is given to natural forest, it acts as a key factor to make the opportunity cost of sustainable forestry high.

Most tropical forests are owned by the state, in one way or another. The state has had the prevailing tendency to apply administrative pricing of standing timber or stumpage pricing at lower levels than the actual competitive price levels (Repetto & Gilles 1988, Treue 1994, Angelsen & Wunder 2003). In this way, the high opportunity cost of the sustainable management of natural tropical forests is, at least partially, artificial. We may ask why? After more than half a century of forestry development projects by the FAO, the World Bank, the International Tropical Timber Organisation (ITTO), and other agencies, how and why does this kind of undervaluation of natural tropical forests continue?

When private ownership prevails, we can avoid this kind of a problem. For example, in Finland, the state forest service can get competitive price references from the private stumpage and timber markets. When it invites tenders from potential buyers, it would choose a buyer who can best match the market price or cancel any sales if no tenders sufficiently match the market level.

The description of deforestation used here is a three-level, multisector process, where factors at the different levels are organized in various cause-effect chains. In the specification of this modelling the local agents are excluded. The visible local agents are clearing the forests, but it is not possible to control them directly by command. We concentrate on some key underlying factors at the national and international levels, which can be more effectively used to control deforestation. The specification of the model is therefore guided by this rationale and by the availability of valid and reliable data.

It also makes a difference which concept of forest is applied in relation to poverty (Palo 1999, Angelsen & Wunder 2003). Here we shall use the concept of natural forests, which covers the different types of tree arrangements, with the exception of plantation forests. This therefore includes: rain forests, moist, semi-moist, semi-arid, arid, montane, and cloud forests in the various tropical countries. The forest and tree concepts used are from the FAO's Forest Resources Information System (FORIS) database (Marzoli 1995). Instead of absolute variables (e.g. forest area) we selected ratio variables (e.g. forest area/non-forest area). We also considered stock variables more reliable than change variables.

We selected forest area/non-forest area as a dependent variable. It has a declining s-form function, which best simulates the theoretically assumed form of decreasing relative forest area. While forest area/total area has a range from 0 to 100, forest area/non-forest area can have values higher than 100. Therefore, the latter satisfies the assumption of a random distribution of regression modelling residuals better than the former.

We applied the relative, national, natural forest area data as a dependent variable. These data have been updated by the FAO to the year 1995 (FAO 1999). The independent economic variables are lagged by five years from their respective 1995 forest area data, in order to allow a cause effect to mature. The ecological and dummy variables are assumed not to change over time.

“Human beings have always depended on forests. Initially, we used them as places to live. We hunted in them for game, foraged for fruits and nuts and gathered for [sic] fuel. Our relationship with our habitat was essentially no different than that of any other animal. The development of settled agriculture [sic] economies to replace those based on hunting and gathering required the clearing of forest.” (Drushka & Kontinen 1997, p.17).

We may conclude from this citation, that those forest people were, and still are located in many corners of the tropical world, income poor, but eventually consumption rich if the population densities are not too high in relation with the carrying capacity of the forest habitat. This refers to a situation of some importance still today, in that the income-variable alone may not be a valid measure of poverty in the tropical world.

Therefore, we selected the three-dimensional Human Development Index (HDI)(UNDP 1998) as our poverty indicator. The HDI is a simple composite average of the indexes on life expectancy at birth, adult literacy, and school enrolment as well as local purchasing power parity of GDP per capita (UNDP 2003). We assumed that when poverty is increasing, then relative forest area is decreasing. A poverty increase means a decrease in the HDI. This means we expect a positive correlation for the HDI with the forest area/non-forest area ratio. A further assumption in our study countries was that the forest areas were regulated mostly by public forestry (states own a majority of natural forests) with administrative stumpage pricing, and where open access to forests prevails.

A simple two variable Pearson correlation for the 83 tropical countries between the natural logarithms of natural forest area/non-forest area and the HDI was computed as $r = 0.55$ when weighted by forest areas and as 0.29 when not weighted (Figure 2). The observations are distributed evenly over the whole range of the HDI with no remarkable outliers. The distribution is therefore statistically quite operational.

Ln(Forest area / nonforest area₁₉₉₅)

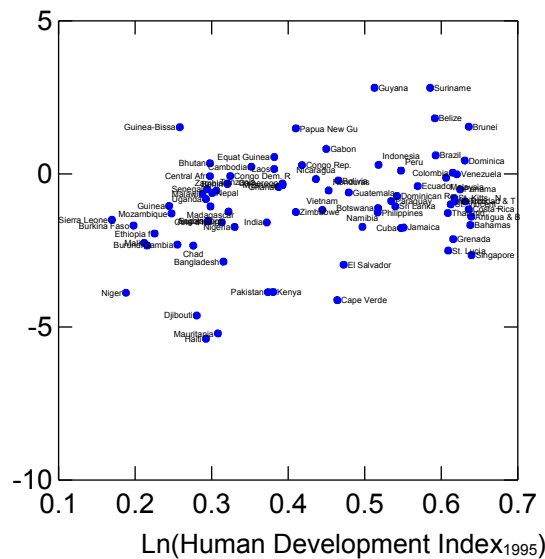


Figure 2. Correlation between natural forest area/non-forest area and the Human Development Index for 83 tropical countries. Weighted $r = 0.55$, unweighted $r = 0.29$ (data sources: FAO/FORIS 1999, UNDP 1998).

Income (gross national product GNP) per land area-variable is assumed to indicate the overall environmental pressure of economic development, for instance, the clearing of forests for agricultural expansion, for urbanisation, or for physical infrastructure, such as roads, reservoirs, hydroelectric power stations, etc. Therefore, we assume that increasing the GNP per land area causes a decrease of the forest area, which is indicated by a negative correlation in our model specification. It is interesting to realize that GNP/land area can also be interpreted as an interaction variable as follows:

$$\text{Population/land area} \times \text{GNP/Population} = \text{GNP/land area}$$

This indicates the interaction of the population density and the income per capita. The GNP per land area and the population density were found to be strongly correlated. Therefore both could not be included in the regression model (Table 1, Equation 1).

Expanding exports of forest, agricultural, mining, and other products increase the respective domestic demand, causing derived demand for deforestation or the clearing of forests. For example, expanding exports of forest products will increase commercial logging and more logging roads will be constructed. After the selective logging has been completed, the concessionaire has no motivation to close the roads, thus providing access for subsistence farmers. These farmers then will arrive and finalise the deforestation of the area. Furthermore, expanding agricultural exports increase domestic demand for agricultural products. Under conditions of extensification, this will expand forest clearing

or for agriculture. Openness in trade is an indirect underlying cause of deforestation that is linked via multiple cause-effect chains.

In addition, an expanding openness in trade will indirectly decrease the forest area, because no scarcity effect will appear in the form of increasing real stumpage prices and real value of the remaining forest. Increasing imports may have a similar effect, because increasing imports imply increasing current account deficiencies. This again means increasing future exports in order to counterbalance these payments. Therefore, we specified this openness of trade variable as the value of total exports plus the value of total imports divided by the value of the total GDP; a negative value was assumed.

The impacts of agricultural technologies and productivity on deforestation have been examined lately by intensive micro-case studies with varying results (Angelsen & Kaimowitz 2001). We do not know of any similar studies at the macro level. The variable selected to measure agricultural productivity may also have some unknown additional effect on the model results. Here we applied the agricultural value added per hectare of agricultural land as the variable to indicate agricultural productivity. We assumed that most of our study countries were operating under the conditions of labour-intensive technology in a context with limited opportunities for in-migration, and an inelastic demand for agricultural products. Under these circumstances an increase in agricultural productivity at the national level causes an increase in the forest area or a positive effect.

Our complete model specification is represented by:

$$FA_{it} = FA(ec_{it}, wv_{it}, HD_{it}, GL_{it-5}, OT_{it-5}, AP_{it-5}) + \varepsilon_{it} \quad [1]$$

(+/-) (+) (-) (-) (+)

FA = national natural forest area,
 i = number of the country,
 t = year 1995,
 ec = a vector for ecological variables,
 wv = a vector for weight variables (i.e. forest data reliability and forest area),
 HD = Human Development Index,
 GL = GNP per land area,
 OT = openness of trade (i.e. value of total exports plus imports per GDP),
 AP = agricultural productivity (i.e. agricultural value added per agricultural land area),
 ε = residual.

This equation [1] was applied for estimating the model in Table 1.

Model estimation and results

All of the variables were transformed into natural logarithms. The multiple regression was done with Weighted Least Squares (WLS) estimation. In weighting, we applied a ratio variable forest area divided by the reliability class of the forest inventory. In this way the countries with the higher reliability of forest inventory data and with larger

forests received more weight (footnote of Table 1). We applied this kind of weighting ourselves; we have not seen it used before in deforestation modelling.

The relationship of forest and poverty was made using pilot modelling (Palo 2004). Among the 83 tropical countries the relative forest area increased in relation to increases in the income per capita. However, since forest areas are declining or deforestation is taking place in all of the countries studied, it is more rational to view this process from the opposite direction: at the national level increasing income poverty is reducing the forest area. Population density was another independent variable applied in this simple model: with increasing population density the relative forest area is also reduced. Income poverty and population density are both statistically significant at 0% risk and they jointly explain 30% of the variation in the relative forest area variable. The 83 countries include 99% of the total tropical forest area.

In the same 83 tropical countries an increase in poverty as measured by the Human Development Index (HDI) also decreased the relative forest area (Figure 3). The HDI and population density jointly explained 43% of the variation in the relative forest area. It is highly interesting that by replacing the GDP per capita with the HDI the degree of determination (i.e. the adjusted R square) was increased from 30% to 43%. Both regression coefficients were statistically significant at 0% risk. A wider poverty concept, the “opportunity” or the Human Development Index had the effect of explaining the relationship between poverty and deforestation better than the income poverty concept. Also of special interest is that this model gives a pan-tropical explanation that includes the three tropical continents.

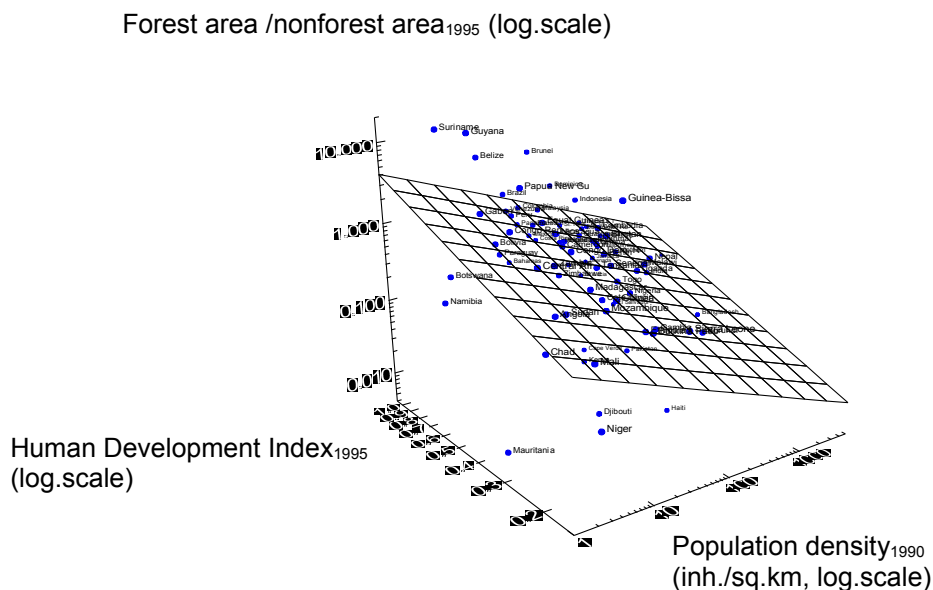


Figure 3. The relative forest area as a function of population density and the Human Development Index (HDI) for 83 tropical countries. The weighted R square = 0.43 (Palo 2004).

Next we divided the group of 83 tropical countries into poor and rich countries. The poor 40 countries had a HDI < 0.5 and the rich 43 countries had a HDI \geq 0.5. The adjusted R squared was 0.39 and 0.13 respectively (Figures 4-5). The joint impact of poverty and population density was stronger for the poor country group than for the rich country group. The regression coefficients of both the HDI and the population density were statistically significant with 0% risk for the poor country group, but for the rich country group only the coefficient of population density was statistically significant with a 1% risk and, interestingly, the coefficient of the HDI was no longer significant (risk = 66 %).

Forest area /nonforest area₁₉₉₅ (log.scale)

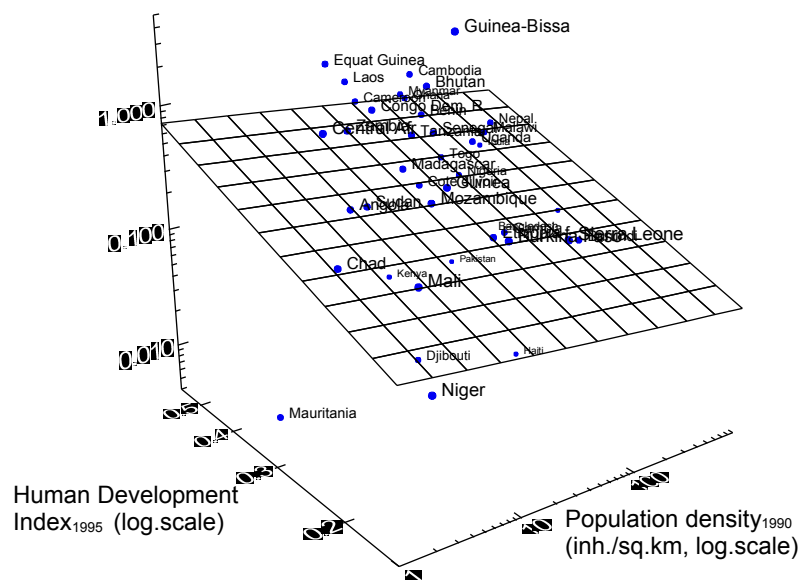
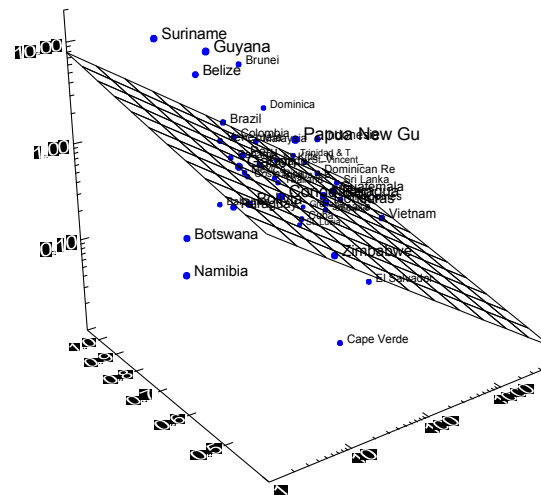


Figure 4. The relative forest area as a function of the population density and the Human Development Index (HDI) for 40 tropical countries with a HDI < 0.5. The weighted R square = 0.39.

Forest area/non-forest area



Human Development Index

Population density

Figure 5. The relative forest area as a function of the population density and the Human Development Index (HDI) for 43 tropical countries with a HDI ≥ 0.5 . The weighted R square = 0.13.

We were able to vary the outcomes of the models described previously by modelling with seven independent variables: three ecological variables and four socio-economic variables. The modeling explained 73% of the variation of the relative forest area in 64 pan-tropical countries. The availability of data reduced the number of countries from the initial 83 to 64. The 64 countries include 84% of the total natural forest area in the tropics. The poverty variable, the HDI, was highly significant statistically (less than 1% risk) and with the expected influence of an inverse relationship: the more poverty, the less relative forest. The other socio-economic variables were the GNP/land area, external trade/GDP, and agricultural productivity. All of them were highly significant statistically and with the expected relationships (Table 1, Equation 1). The standardized coefficients of the HDI and the GNP/land area were the highest of the independent variables (Table 1). Therefore, these two can be interpreted as having the strongest explanatory power in the model. A third equally important variable was found to be the population density (Figure 3). Any multicollinearity among the independent variables was acceptably low (Table 2, $\max |r| < 0.67$). The distribution of the model residuals was acceptably random and narrow.

In this kind of modelling, data with reliable time series for forest areas or deforestation are missing. The time dimension is inherent in this modelling due to the different development stages of the countries studied. In a previous study we had shown that we could reach quite similar results with this kind of model by applying either the original inventory data or the updated 1995 data as we have done here (Palo et al. 2000). The HDI was first published with an adequate number of country examples in a report that included data from 1995 (UNDP 1998). Therefore we could not use the older original data in our modelling. We also could not lag the HDI variable back by five years to 1990, which we did to other socio-economic variables.

The three ecological variables, 1-3 of Table 1, were used to harmonise the wide ecological variability of the 64 tropical countries. They all had statistical significance for their regression coefficients of less than 3% risk. In this way we made the countries have a better fitting explanation for the socio-economic variables, 4-7 of Table 1.

The message from this modelling of the role of poverty in relation to forests is rather clear, since we concluded that a high level of poverty and a low relative forest area at the national level are strongly correlated statistically. There may be a vicious circle here as described by Dasgupta (1995). A higher population density at a low level of income consumes more forest goods and services and increases deforestation, forest degradation, and desertification. A poorer forest environment increases the level of poverty, which in turn increases the population density in the remaining forest and so on. This may be true, especially under African and South Asian conditions. Countries in these regions represent about half of the pan-tropical forest area.

Table 1. The estimated regression model for a declining relative forest area with the Human Development Index (HDI).

Dependent variable: Forest area /nonforest area ₁₉₉₅

Independent variables	Coefficient	Standard error	Standardized Coefficient
Intercept	0.62	6.09	0.0
1 Moist ecological zone % of land area	0.17**	0.07	0.17
2 Dry ecological zone % of land area	-0.18***	0.07	-0.28
3 Island dummy	0.51**	0.23	0.17
4 Human Development Index ₁₉₉₅	5.10***	0.90	0.73
5 GNP/land area ₁₉₉₀	-0.56***	0.10	-0.79
6 Trade % of GDP ₁₉₉₀	-0.46***	0.09	-0.46
7 Agricultural productivity ₁₉₉₀	0.30***	0.10	0.34
Number of countries	64		

Adjusted R square	0.73
Standard error of estimation	48.3
F-statistic	25.2
Significance of F-statistic	0.00

Notes: *** =Significance level under 1%, ** =Significance level under 5%.

Log-Log WLS estimation. Cases weighted by value of variable Forest area 1995 (ha) times reliability class of forest inventory (1=High, 0.5=Average, 0.25=Low).

Data sources: FAO FORIS 1999, World Bank 1999, & UNDP 1998.

Table 2. The Pearson correlation matrix for the model from Table 1.

	Relative forest area	Moist area %	Dry area %	Island dummy	HD Index	GNP/land area	Trade % of GDP
1 Moist area %	0.230	1.000					
2 Dry area %	-0.478	-0.049	1.000				
3 Island dummy	0.016	-0.246	-0.287	1.000			
4 HD Index	0.483	-0.147	-0.149	-0.038	1.000		
5 GNP/land area	-0.040	-0.292	0.094	0.127	0.662	1.000	
6 Trade % of GDP	-0.421	-0.164	-0.309	0.344	-0.463	-0.272	1.000
7 Agricult. prod.	0.012	-0.328	-0.306	0.290	0.143	0.562	0.149

Discussion

“In the humid tropics the horizontal expansion of the different forms of agriculture (and animal husbandry) constitutes the most important direct overall factor, since it is responsible for nearly 85 percent of deforestation” (Lanly 2003, p. 79). In this citation Jean-Paul Lanly, the former head of the FAO Forest Resources Division, fails to realize that the high opportunity cost of sustainable forest management is to a great extent due to the prevailing administrative under pricing of standing timber (Repetto & Gillis 1988, Treue 1994, Angelsen & Wunder 2003).

We tried to avoid the impression, as a consequence of our modeling, that a poor marginal farmer was regarded as a cause of tropical deforestation. The late Jack Westoby, the well-known forest economist of the FAO, used to say, that this statement is equally true, only if an individual soldier is regarded as a cause of war. The local economic agents are striving for subsistence or profit maximization, but they are primarily reacting to the financial incentives put in place by the national governments and international markets. The real causes of deforestation are the policy, economic, institutional, distributional, and demographic factors underlying these local actors (Uusivuori et al. 2002).

In Finland, shifting cultivation, deforestation, and forest degradation were common especially during the 19th century. The Great Land Reform (*Isojako*) and the establishment of the State Forest Service and the College of Forestry in the middle of the 19th century supported the closing of the existing open access to forests. Industrialisation in Western Europe simultaneously increased the demand for forest products and raised the stumpage prices, based on the new clear and strong property rights, as well as increasing incomes for the farm forest owners labour related to forestry. Numerous landless people could also benefit from increased incomes from forestry work. Under the poorly developed financing institutions of the time this forestry income played a key role in raising agricultural productivity. In Finland, shifting cultivation and deforestation were discontinued primarily due to market driven processes with the aid of the necessary judicial infrastructure: the increasing value of forests lowered the opportunity cost of sustainable forestry and the increasing agricultural productivity provided sufficient food from a smaller area than was needed during the shifting cultivation era (Palo 2004).

Reducing poverty by utilising the tropical forests and especially via the Clean Development Mechanism (CDM) of the Kyoto Protocol provides new options, but may be rather time consuming when the expected results on any larger scale are safeguarded. Because corruption first has to be reduced, then land reforms carried out, and finally a number of market-supporting judicial and information infrastructures created. Implementation of such projects can provide labour income and with some use rights purchased also provide some sales income, but the full arsenal of the market system, which has eradicated poverty in Finland on a national scale, is still missing in the tropics.

Without continuous economic growth major poverty reduction is not feasible. However, a delicate issue remains, this is how the welfare would trickle down to the poor? “Sometimes growth helps the poor sometimes not. There are policies that in the long run may enhance growth and reduce poverty, such as enhancing education opportunities...” (Stieglitz 2003). The countries in East Asia have simultaneously promoted growth and equity; therefore, they provide illustrative cases of the effectiveness of this strategy (Stieglitz 2003).

History may not provide a reference to any country, where a remarkable poverty reduction has taken place via a voluntary action by the ruling elite class. The poor must have or take economic and political power in order to change the income distribution so as to reduce poverty. The idea of sustainable livelihoods and the five-capital/assets approach (Hyden 1998, Angelsen & Wunder 2003) may be helpful to understand the operation of this process. The framework for action by the World Bank (2001, p. 37) reads as follows: “To attack poverty requires promoting opportunity, facilitating empowerment, and enhancing security – with actions at local, national, and global levels. Making progress on all three fronts can generate the dynamics for sustainable poverty reduction.”

It is now time to respond to the vital question that is the title of this paper, “Poverty reduction by tropical forests?” First, with another question, Why has the Westobian theory (Westoby 1962) gained empirical support in Finland and not in the tropics? It may

be that the necessary implicit preconditions, such as closed access to forests, strong and clear private property rights, absence of corruption, and absence of major government and market failures, have existed in Finland, but not in the tropics. When openness of a country to external trade increased in Finland, it supported both economic growth and sustainable forest management.

Conversely, in the tropics an increase in the openness of a country to external trade has increased deforestation (Palo & Lehto 2000). No “invisible hand” in the form of increasing real stumpage prices as a market-based brake has appeared along with the advancing deforestation (Figure 1). When the value of the remaining tropical forests has not been increasing, no financial incentive for intensification of sustainable forest management has appeared. Additionally, too often the financial capital gained by the elites benefiting from timber exploitations has flowed abroad or to luxury goods, instead of investments in domestic forest plantations or timber processing.

The FAO transited from an export-led or an import-substituting forest industrialization paradigm towards community and social forestry in the later part of the 1970s and all of the 1980s, as also did the World Bank (Palo 1988). The mission of community and social forestry was to attack economic underdevelopment /poverty, not through the top-down approach cited in the Westobian theory, but through a bottom-up strategy. So far, we have not seen any examples of remarkable large-scale poverty reduction via community and social forestry. Why? Maybe no integrated theoretical framework that supports these strategies has been developed far enough. Theory at its best is very practical: it can guide research and policy in the face of complex processes like that of poverty reduction by forests. Action without guidance of or the relevant explicit theory will remain ineffective. Human actions are mostly guided by theories, but often in an implicit way.

Poverty reduction on a large scale by the tropical forests will, we believe, remain rhetoric as long as no integrated theory exists to indicate the operational steps to be followed. The “sustainable livelihoods approach combined with governance” process described by Hyden (1998) for the UNDP is one worthwhile candidate for this position. In fact, we have implicitly adopted an approach close to that here. This recap is, however, strongly meant to advance stable and democratic governance. Such a recap had earlier been considered a radical invasion into the internal affairs of national governments, and even a call for revolution. Hyden (1998) regards support for effective “governance” or changing the rules of politics to favour the poor as a fitting approach for UNDP experts and consultants.

In fact, the UNDP (2003) has been supporting this approach and considered quite radical for the 13 years since it has been publishing sensitive national data about the progress of human welfare. What about agencies that have been more concerned with tropical forests, such as the FAO, the World Bank, and the ITTO? In these cases no similar publishing of the individual national progress with regard to sustainable forest management or forest-based development has taken place. Is it possible that the UNDP is by its organizational structure closest to the UN mainstream ideology?

We may conclude here, that poverty reduction through tropical forests will remain rhetoric at least for some decades to come, unless a radical change in strategies and their implementation take place. We have presented empirical evidence here that the decrease in forest area and the increase in poverty are strongly correlated. Our scientific scenarios show a continuous decline of natural tropical forests at least until the 2020s (Figure 1). From now until then, between 29%–44% of Asian tropical forests will be deforested. These findings are based on two scientific articles (Palo et al. 1999, Palo & Lehto 2000). A third article indicates that about half of the present African tropical forests may be lost by the 2020s (Palo & Lehto 2003b). Since most of the world's poor reside in tropical Africa and tropical Asia, these scenarios seriously undermine the ambitious goals set for poverty reduction by the UN and its family members.

There may also be some good news from all this: audible rhetoric plays a positive role in world politics. A number of positive past global achievements by the UN have been identified (UNDP 2003, p. 31). It can also be regarded as an achievement that poverty reduction through tropical forests has been included on the world political agenda, but it is not a sufficient advancement. Under continuous deforestation and socialistic forestry no real advancement to the large-scale reduction of poverty is registered. What about the bad news? After changing the rhetoric each decade, from forest-based industrialisation, to community forestry, to social forestry, and now to poverty reduction, an impression is given to the media and the public at large, that each rhetoric/agenda has been effectively implemented. We hope this paper serves the purpose of mobilising an evaluation of the accomplishments of these varying agendas.

References

- Angelsen, A. & Kaimowitz, D. 2001. *Agricultural Technologies and Tropical Deforestation*. Wallingford, UK, CABI Publishing.
- Angelsen, A. & Wunder, S. 2003. *Exploring the forest-poverty link: key concepts, issues, and research implications*. Occasional Paper No. 40. Bogor, Indonesia, CIFOR. 58 pp.
- Asian Development Bank 2001. *Taking Action Against Corruption in Asia and the Pacific*. Papers Presented at the Third ADB/OECD Conference on Combating Corruption in the Asia-Pacific Region. Manila, ADB.
- Dasgupta, P. 1995. The population problem: theory and evidence. *Journal of Economic Literature*, Vol. 33, pp. 1879–1902.
- Druska, K. & Konttinen, H. 1997. *Tracks in the forest. The evolution of logging machinery*. Helsinki, Timberjack Group. 254 pp.
- FAO 1999. *State of the world's forests 1999*. Rome.
- FAO 2001. *State of the world's forests 2001*. Rome.
- FAO 2003. *State of the world's forests 2003*. Rome. 151 pp.
- FAO/DFID 2001. *How forests can reduce poverty*. Rome. 25 pp.
- Hyden, G. 1998. *Governance for sustainable livelihoods: operational issues*. Paper commissioned by UNDP.

- Lanly, J-P. 2003. *Deforestation and forest degradation factors*. Congress Proceedings B, XII World Forestry Congress, pp. 75 – 83. Quebec City.
- Marzoli, A. 1995. *FAO Forest resource assessment 1990. Forest Resources Information System (FORIS). Concepts and methodology for estimating forest state and change using existing information system documentation*. FAO, Rome.
- Mills, J. S. 1846. Logics. The Internet encyclopedia of philosophy. John Stuart Mill (1804-1873). www.utm.edu/research/iep/m/mills.htm
- Oksanen, T., Pajari, B. & Tuomasjukka, T. (Eds.) 2003. *Forests in poverty reduction strategies. Capturing the potential*. Proceedings No. 47. Joensuu, European Forest Institute. 206 pp.
- Palo, M. 1988. The forest-based development theory revisited with a case study of Finland and prospects for developing countries. In M. Palo & J. Salmi eds. *Deforestation or development in the Third World? Volume II*, pp. 13-156. Metsäntutkimuslaitoksen tiedonantoja 309. Helsinki, Forest Research Institute.
- Palo, M. 1999. What is forest – concepts and etymology. In Palo, M. & Uusivuori, J. eds. *World forests, society and environment. Volume I*, pp. 12–13. Dordrecht/Boston/London, Kluwer Academic Publishers/World Forests.
- Palo, M. 2000. Global prospects on deforestation and transition. In M. Palo & H. Vanhanen eds. *World forests from deforestation to transition? Volume II*, pp. 3–21. Dordrecht/Boston/London, Kluwer Academic Publishers/World Forests.
- Palo, M. 2003. Evolution of sustainable forest management in Finland with impacts of globalization. *Proceedings of the International Conference on Integrative Approaches towards Sustainability*. Baltic Sea Region taking the lead, pp. 60–69. Riga, University of Latvia.
- Palo, M. 2004. Poverty reduction by tropical forests: rhetoric or a viable option? In Sim, H. C., Appanah, S. and Youn, Y. C. (Eds.): *Forests for poverty reduction: Opportunities with Clean Development Mechanism, environmental services and biodiversity*, p. 7-24. FAO, Bangkok.
- Palo, M. & Lehto, E. 2000. Modeling tropical deforestation and carbon flux scenarios. *Proceedings/TFI Environmental change*. XII IUFRO World Congress, Kuala Lumpur.
- Palo, M. & Lehto, E. 2003a. *Deforestation by corruption?* A manuscript available from the authors.
- Palo, M. & Lehto, E. 2003b. *African deforestation: causes and scenarios*. Proceedings B. XII World Forest Conference, Quebec City.
- Palo, M., Lehto, E. & Enroth, R-R. 1999. Scenarios on tropical deforestation and carbon fluxes. In M. Palo ed. *Forest transitions and carbon fluxes. Global scenarios and policies*. World Development Studies 15. Helsinki, UNU/WIDER.
- Palo, M., Lehto, E. & Uusivuori, J. 2000. Modeling causes of deforestation with 477 subnational units. In M. Palo & H. Vanhanen eds. *World forests from deforestation to transition? Volume II*, pp. 101–124. Dordrecht/Boston/London, Kluwer Academic Publishers/World Forests.
- Palo, M. & Uusivuori, J. 1999. Forest-based development in Finland - A unique success? In M. Palo & J. Uusivuori eds. *World forests, society and environment. Volume I*,

- pp. 300-318. Dordrecht/Boston/London, Kluwer Academic Publishers/World Forests.
- Repetto, R. & Gillis, M. (Eds.) 1988. *Public policies and the misuse of forest resources*. Cambridge University Press.
- Scott, W. 1981. *Concepts and measurement of poverty*. Geneva, UN Research Institute for Social Development. 62 pp.
- Sim, H. C., Appanah, S. and Youn, Y. C. (Eds.) 2004. Forests for poverty reduction: Opportunities with Clean Development Mechanism, environmental services and biodiversity. FAO. Bangkok. 178 p.
- Smith, J. & Scherr, S. J. 2002. *Forest carbon and local livelihoods: assessment of opportunities and policy recommendations*. Occasional Paper No. 37. Bogor, CIFOR. 45 pp.
- Stieglitz, J. E. 2003. Poverty, globalization and growth: perspectives on some of the statistical links. In *UNDP: Human development report 2003*, p. 80.
- Treue, T. 1994. Evaluation of the Ghanaian timber royalty system. In F. Helles & M. Lindal eds. *Scandinavian Forest Economics 35*, pp. 409-422.
- UNDP 1998. *Human development report 1998*.
- UNDP 2003. *Human development report 2003*. Millennium development goals: a compact among nations to end human poverty. Oxford, UK. Oxford University Press. 367 p.
- Uusivuori, J., Lehto, E. & Palo, M. 2002. Population, income and ecological conditions as determinants of forest area variation in the tropics. *Global Environmental Change* 12(4), pp. 313–323.
- Wardle, P. (Ed.) 2003. *World forests, society and environment. Executive summary*. Tokyo, The United Nations University. 53 pp.
- Westoby, J. 1962. *The role of forest industries in the attack of economic underdevelopment. The state of agriculture*. FAO, Rome.
- Westoby, J. 1978. *Forest industries for socio-economic development*. Eighth World Forestry Congress. (FID/GS Jakarta).
- World Bank 1990. *World development report 1990. Poverty*. Oxford University Press. 260 pp.
- World Bank 1999. *World Development Indicators* (CD-ROM). Washington DC.
- World Bank 2001. *World development report 2000/2001. Attacking poverty*. Oxford University Press. 335 pp.
- World Bank 2003. *Sustaining forests. A World Bank strategy*. Washington DC. 24 pp.