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POVERTY REDUCTION BY TROPICAL FORESTS?

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Abstract

Human Development Index as a national poverty measure is regressed with relative forest area as a dependent variable, and with population density, and six other independent variables in 64 tropical countries. They cover 84 % of the total tropical forest area. It was found that the adopted poverty variable was strongly correlated with the relative forest area. It was assumed that high population density at low income levels advances forest degradation, deforestation and desertification. The deteriorated forest environment as 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 the standing timber undervalues the tropical forest. Therefore, the opportunity cost of sustainable forestry remains artificially too high and is expanding deforestation with corruption and some other causes underlying the local visible agents of deforestation. In Finland 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 used only for consumption but also invested in raising productivity in agriculture. This pattern of tenure reduced effectively poverty in a national scale. In the tropics increasing exports have advanced deforestation with minimal impacts in poverty reduction. Most tropical countries are lacking a balanced mix of institutions, policies and markets in support of poverty reduction by forests. Therefore, poverty reduction by the tropical forests will remain as rhetoric for the time being. It may become a viable option only in a couple of decades with a major devolution of the prevailing socialistic forestry and eradication of corruption.

Introduction

The United Nations (UN) declared to halve the number of the extreme poor and of the people suffering from hunger by 2015 as the first of the eight goals in its Millennium Declaration of September 2000 It is recognized that the halving of poverty and the attainment of the other related goals can be achieved only through stronger partnership among all the development actors. (UNDP 2003, p. 27). Therefore, it is no wonder, that attacking poverty has lately become a popular rhetoric among the inter-governmental organizations (IGOs) and the non-governmental organizations (NGOs) as well as the national development agencies.

UNDP (2003) has contributed on the follow-up and on the construction of instruments how to end human poverty since 1990 by publishing its Human Development Index

annually. The 2003 report introduces a penetrating analysis of how the countries are related in achieving the eight Millennium Goals and how to launch improvements.

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

The Asian Development Bank (2001) joined the effort with its poverty reduction agenda. Also FAO has adopted an agenda (FAO/DFID 2001), how forests can reduce poverty, with some later ramifications (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. SNU 2003) in this field lately.

Finland has only 0.5 percent of the total forest area of the world but as high share as 15 percent of the value of the total global forest products exports. The Finnish exports of forest products exhibit highest values both on per capita basis and on the percentage share basis of the total commodity exports among the eight largest exporting countries of forest products in the world. Forestry and 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 dominating role in timber supply in 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 impacts on reduction of poverty with those in the tropical countries. If surprising to some readers, this comparison follows the idea by John Stuart Mill, the 19th century British classical economist and philosopher: by comparing some phenomenon in its minimum and maximum we may improve our understanding of this phenomenon.

The seminal paper on "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 FAO forestry development projects for about 15 to 20 years with a 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 raised above and in the title of this paper. The purpose is to describe the concept of poverty and its linkage with tropical forests at the national level globally. Finally, some discussion with conclusions are given.

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, NGOs and the various national governments and development agencies in slowing down tropical deforestation (Figure 1). Poverty reduction may be also a viable instrument to facilitate more external funding for forestry development projects.

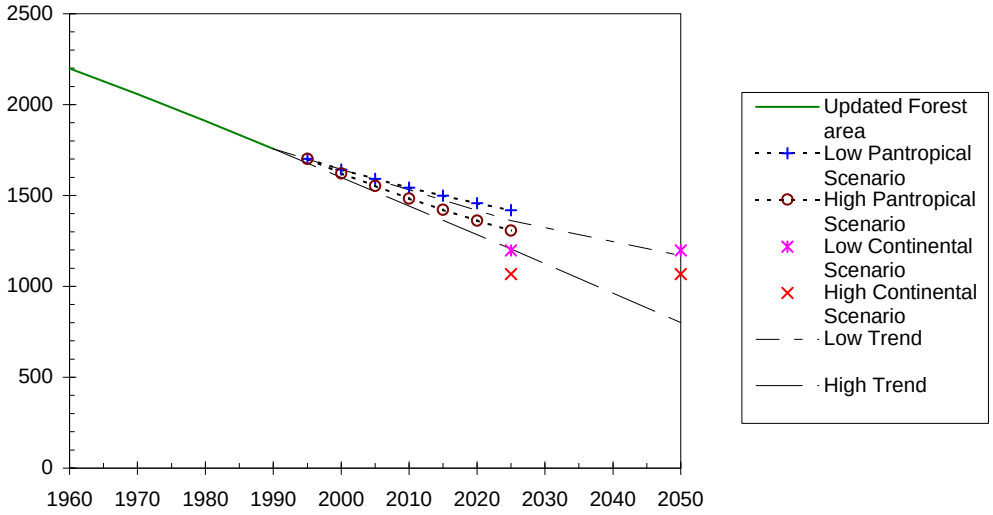

Figure 1. Declining natural forest area in the tropics 1960–2050 (Palo et al. 1999, Palo & Lehto 2000).

The paper is restricted to study the linkages between poverty and all 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 forest area as possible. In fact, in this way we can capture most of the poor people (World Bank 2001) and 84 – 99 percent of the total tropical forest area in the world (FAO 2001, Palo & Lehto 2003a). The paper partly reviews a previous paper by one of the present authors (Palo 2004), but it introduces further theoretical and empirical evidence in support of the above 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 this earth live on less than US$2 a day. A clear reduction in a 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 and food, health and

education, empowerment of people and freedom of choice. Furthermore concepts like sustainable livelihoods and five-capital approaches have been introduced. The latter one is composed of natural, human, social (political), cultural (physical) and financial capital. A success in poverty reduction is dependant of an access to all of the five kinds of capital. (Hyden 1998, Smith & Scherr 2002, Angelsen & Wunder 2003). Accordingly, a theoretical deduction can be already made, that in poverty reduction an access to forests as one kind of natural capital can alone 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 UNDP, which is composed as a simple average of life expectancy, education and GDP per capita indexes (UNDP 2003).

Angelsen and Wunder (2003) analysed the varying concepts of poverty. After a multiple of concepts they arrived at a definition of poverty as a 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 the poverty indicator is dependent on the research context and goals, budget, duration and the specific need for comparative analyses.

Accordingly, there exist a number of poverty concepts available for our analysis. We are restricted in the best empirical measure, namely `opportunity` in the meaning of the World Bank (2001). This is an absolute poverty concept. We shall not use any relative poverty concepts. On the other hand, we shall 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 direct local actors of deforestation, such as colonists, agriculturalists, shifting cultivators, cattle rangers, fuelwood gatherers, industrial loggers and infrastructure developers, are acting according to prices, taxes and subsidies or coercion applied by the national or international actors. The real causes of deforestation are underlying the local level. 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 direct local actors of deforestation have their individual motivations and goals that may be called direct causes of deforestation. Profit maximization and survival are representative examples of such goals. In a brief way, we may state that tropical deforestation is continuing in a non-decreasing pace (Figure 1), because for such economic agents deforestation is more beneficial than maintaining natural forest cover or

practicing sustainable forest management. A low monetary value of natural forest is a key factor making 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 competitive price levels (Repetto & Gilles 1988, Treue 1994, Angelsen & Wunder 2003). In this way, the high opportunity cost of sustainable management of natural tropical forests is, at least partially, artificially made. We may ask why? After more than half a century of forestry development projects by the FAO, the World Bank, ITTO and other agencies, how and why this kind of undervaluation of tropical natural forests is continuing?

When the private ownership is prevailing, 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. It invites tenderst from potential buyers and is choosing a buyer, which best matches the market price or can even reject any sales if the match is missing.

Deforestation is structured here as a three-level, multisector process, where factors at different levels are organized in various cause-effect chains. In the specification of our modeling 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 at some key underlying factors at the national and international levels, which can be more effectively used to control deforestation. The specification of our model is guided by this rationale and by the availability of valid and reliable data.

It makes also a difference which forest concept to apply in relation to poverty (Palo 1999, Angelsen & Wunder 2003). Here we shall use the concept of natural forests, which covers all kinds of other tree formations but not plantation forests. Accordingly, rain forests, moist, semi-moist, semi-arid, arid, montane and cloud forests in the tropical countries are included. Forest and tree concepts of FAO/FORIS-database (Marzoli 1995) are applied. Instead of absolute variables (e.g. forest area) we select ratio variables (e.g. forest area/non-forest area). We also consider stock variables more reliable than change variables.

We selected forest area/non-forest area as a dependent variable. It has a declining s-form, which best simulates the theoretically assumed function 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 modeling residuals better than the former.

We applied the relative national natural forest area data as a dependent variable. These data were updated by FAO up to year 1995 (FAO 1999). The independent economic variables are lagged by five years from the 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 fuel. Our relationship with our habitat was essentially no different than that of any other animal. The development of settled agriculture economies to replace those based on hunting and gathering required the clearing of forest." (Drushka & Konttinen 1997, p.17).

We may conclude from this citation, that those forest people were, and still are in many corners of the tropical world, income poor but eventually consumption rich until 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, that income-variable alone may not be a valid measure of poverty in the tropical world. Therefore, we selected a three-dimensional Human Development Index (UNDP 1998) as our poverty indicator. We assume that when poverty is increasing, then relative forest area is decreasing. Poverty increase means decrease in HDI. It means that we expect a plus sign for HDI in correlation with forest area/non-forest area.

The simple two variable Pearson correlation in 83 tropical countries between the natural logarithms of natural forest area/non-forest area and HDI was computed as r = 0.55 when weighted by forest areas and as 0.29 with non-weighted values (Figure 2). The observations are distributed evenly over the whole range of HDI with no remarkable outliers. Accordingly, the distribution is statistically quite operational.

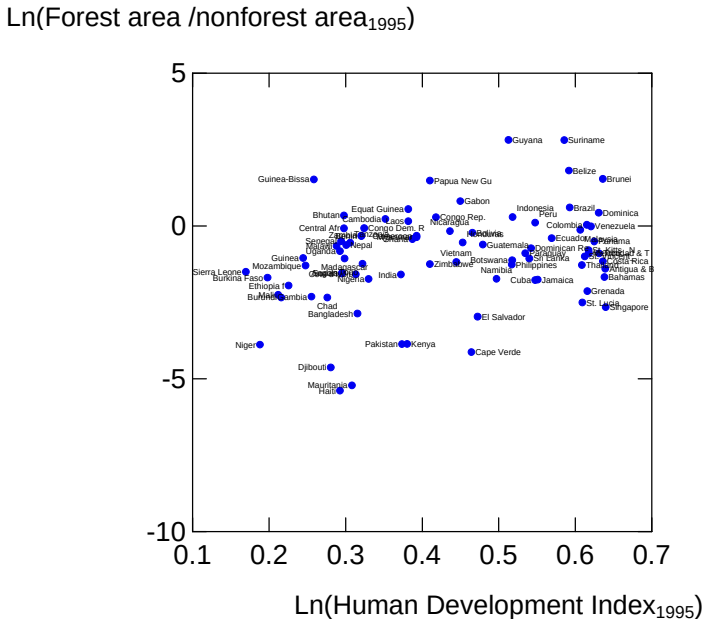

Figure 2. Correlation between natural forest area/non-forest area and Human Development Index in 83 tropical countries. Weighted r = 0.55, r = 0.29 (data sources: FAO FORIS 1999, UNDP 1998).

Income (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 urbanization, or for physical infrastructure, such as roads, reservoirs or hydroelectric power stations etc. Therefore, we assume that increasing GNP per land area causes decreasing forest area, which is indicated by a minus sign in our model specification. It is interesting to realize that GNP/land area can also be interpreted as an interaction variable as follows:

Population/land area x GNP/Population = GNP/land area

Accordingly it indicates the interaction of population density and income per capita.

We assume further that in our study countries of mostly socialistic forestry (states own a majority of natural forests) with administrative stumpage pricing, where open access to forests is prevailing. The expanding exports in forest, agricultural, mining and other products increase respective domestic demand causing derived demand for deforestation or clearing of forests.

For example, expanding exports of forest products will increase commercial logging and more logging roads will be constructed. After prevailing selective logging has been done the concessionaire has no motivation to close the access from subsistence farmers. Hence, they will arrive and finalize deforestation. On the other hand, expanding agricultural exports increase domestic demand for agricultural products. Under extensification conditions this will expand forest clearing or deforestation for agriculture. Openness of trade is an indirect underlying cause of deforestation, which is linked there via multiple cause-effect chains.

Accordingly, expanding openness of trade will indirectly decrease forest area, because no scarcity effect will appear in the form of increasing real stumpage prices and real value of the remaining forest. Also increasing imports may have a similar effect, because increasing imports imply increasing current account deficiencies. This again means increasing future exports for the balance of 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 minus sign was assumed.

The impacts of agricultural technologies and productivity on deforestation have lately been under intensive micro case studies with varying results (Angelsen & Kaimowitz 2001). We do not know similar studies at the macro level. The choice of the variable to measure agricultural productivity may have its own effect. Here we apply agricultural value added per hectare of agricultural land as the variable to indicate agricultural productivity. We assume that most of our study countries are operating under labor-intensive technology in context with limited opportunities for in-migration, and inelastic demand for agricultural products. Under described circumstances increasing agricultural productivity at the national level causes increasing forest area or a positive sign.

To sum up, our model specification is introduced accordingly

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

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

The specification of equation [1] was applied for estimating the model of Table 1 with the Weighted Least Squares (WLS) estimation method.

Model estimation and results

All the variables were transformed into natural logarithms. The multiple regression was run with 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 higher reliability of forest inventory data and with larger forests got more weight in regression modeling (footnote of Table 1). This kind of weighting is our application, which we have not seen used before in deforestation modeling.

We made pilot modeling about the relationship of forest and poverty (Palo 2004). Among 83 tropical countries relative forest area increased along with an increase in income per capita. But when forest areas are declining or deforestation is taking place in all of these countries, it is more rational to view the process from the opposite direction: at the national level increasing income poverty is reducing forest area. Population density is another independent variable applied in this simple model: also with increasing population density the relative forest area is reduced. Income poverty and population density are statistically significant with a zero-risk and they jointly explain 30 percent of the variation of the relative forest area variable. The 83 countries cover 99 percent of the total tropical forest area.

We measured the relationship of forest and poverty also by the poverty concept of the World Bank (2001): opportunity or its close counterpart, the Human Development Index (HDI) by UNDP. HDI is composed as a simple average of indexes on life expectancy at birth, combined adult literacy and school enrolment as well as local purchasing power parity of GDP per capita (UNDP 2003).

In the same 83 tropical countries as above an increase of poverty by this measure also decreased relative forest area (Figure 3). HDI and population density jointly explained 43 percent of the variation of relative forest area. This is highly interesting that by replacing GDP per capita by HDI the degree of determination (the adjusted R square) was

increased from 30 to 43 percent. Both regression coefficients had a statistical significance with a zero-risk. A wider poverty concept, `opportunity`/Human Development Index had a more explanation effect in comparison with the income poverty concept. Also of special interest in this model is that it gives us a pan-tropical explanation over the three tropical continents.

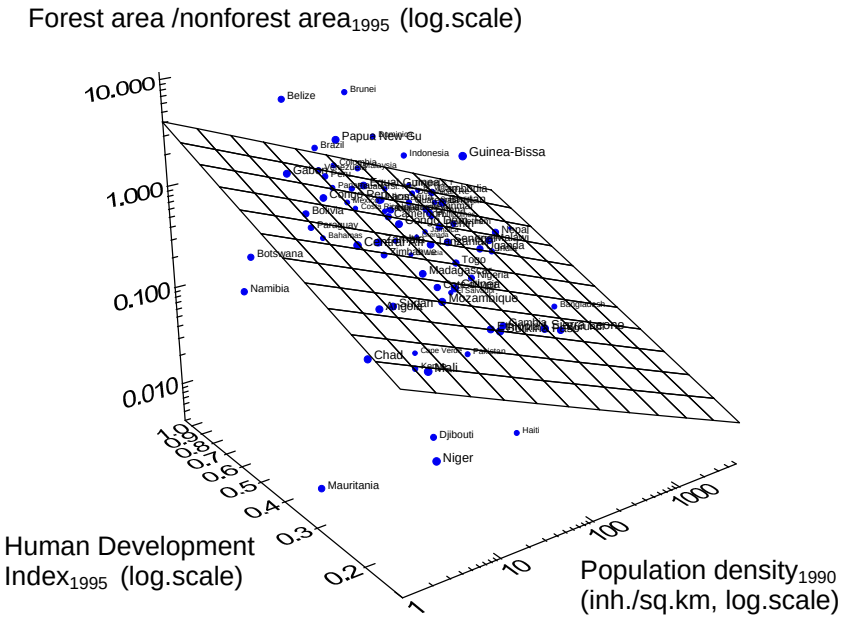

Figure 3. Relative forest area as a function of population density and Human Development Index in 83 tropical countries. Weighted adjusted R square = 0.43 (Palo 2004).

Next we divided the group of 83 tropical countries into poor and rich countries. The poor 40 countries had HDI < 0.5 and the rich 43 countries had HDI > = 0.5. The adjusted R squared was 0.39 in the former group and 0.13 in the latter group. The joint impact of poverty and population density were stronger in the poor country group than in the rich country group (Figures 4-5). The regression coefficients of HDI and population density were statistically significant with a zero-risk in the poor country group but only the coefficient of population density was statistically significant with 1 % risk in the rich country group and that of HDI not (risk = 66 %).

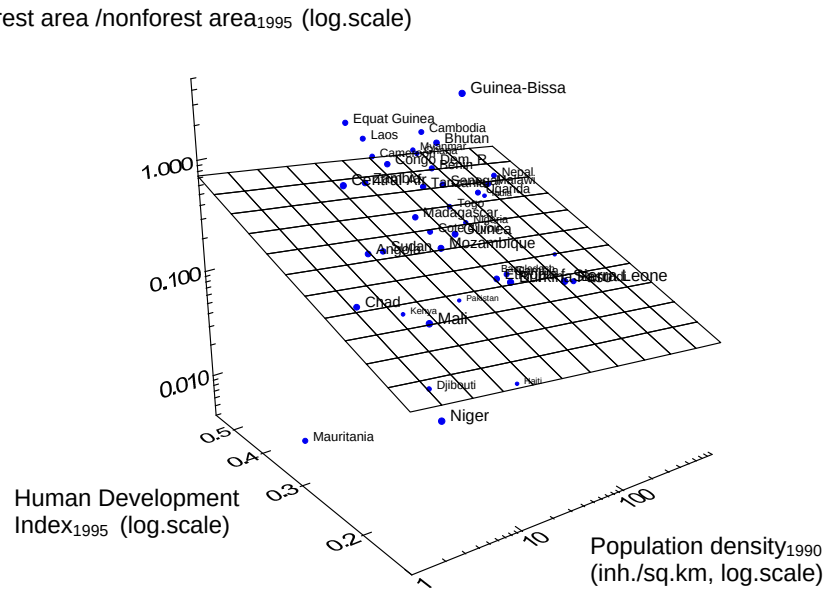

Figure 4. Relative forest area as a function of population density and Human Development Index in 40 tropical countries where HDI < 0.5. Weighted adjusted R square = 0.39.

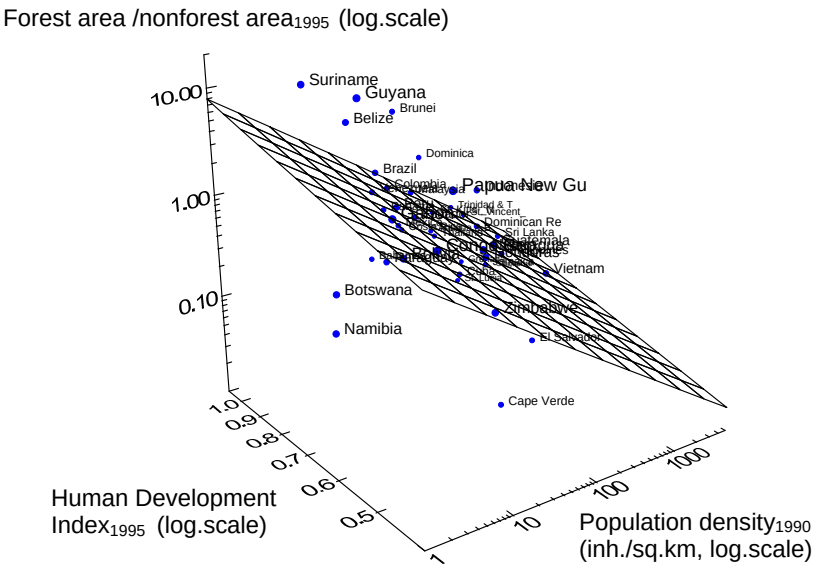

Figure 5. Relative forest area as a function of population density and Human Development Index in 40 tropical countries where HDI >= 0.5. Weighted adjusted R square = 0.13.

We were able to control the above outcomes from two independent variable modeling with a seven independent variable modeling, where we applied three ecological variables and four socio-economic variables. The model explained 73 percent of the variation of relative forest area in 64 pan-tropical countries. The availability of data reduced the number of countries from 83 above to 64 here. The 64 countries cover 84 percent of the total natural forest area in the tropics. The poverty variable of HDI was statistically

highly significant (under 1 percent risk) and with an expected sign: the more poverty, the less relative forest. The other socio-economic variables were GNP/land area, external trade/GDP and agricultural productivity. All of them were statistically highly significant and with expected signs (Table 1, Equation 1). Multicollinearity of all the variables was acceptable (Table 2).

In this kind of modeling reliable time series of forest areas or deforestation are missing. The time dimension is inherent in our modeling due to different development stages of the study countries. In our previous study we have shown that we can reach rather similar results in this kind of model estimation by applying either original year data or updated 1995 data as we have done here (Palo et al. 2000). The three ecological variables 1-3 of Table 1 were harmonizing the wide ecological variability of the 64 tropical countries. They all had the statistical significance of their regression coefficients with less than 3 % risk. In this way we made the countries better fitting for the explanation by the socio-economic variables 4-7.

The message from our modeling about the role of poverty in relation to forest is rather clear. We may conclude that high poverty and low relative forest area at the national level are strongly statistically correlated. We may have here a vicious circle as described by Dasgupta (1995). Higher population density at low level of income consumes more forest goods and services and increases deforestation, forest degradation and desertification. Poorer forest environment increases poverty, which in turn increases population density in the remaining forest and so on. This may be true especially under African and South Asian conditions. These countries represent about half of our pan-tropical forest area.

Table 1. Estimated regression model of declining relative forest area with Human Development

Index.

Dependent variable: Forest area /nonforest area $_{1995}$

	Independent variables	Coefficient	Standard error	Std 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 1998, UNDP 1998.

Table 2. Pearson correlation matrix of the model of 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). The former head of the FAO Forest Resources Division in this citation fails to realize that the high opportunity cost of sustainable forest management is to a great extent due to the prevailing administrative underpricing of standing timber (Repetto & Gillis 1988, Treue 1994, Angelsen & Wunder 2003).

We try to avoid the impression that a poor marginal farmer is regarded, as a consequence of our modeling, as a cause of tropical deforestation. The late Jack Westoby, the well-known forest economist of FAO, used to say, that this statement is equally true, 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 by the national governments and international markets. Accordingly, 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 open access to forests. Industrialization in Western Europe increased simultaneously the demand for forest products and raised the stumpage prices under clear and strong property rights and also labour incomes from forestry for the farm forest owners. Also the numerous landless people could benefit work incomes from forestry. Under poorly developed financing institutions of that time this forestry income had a key role in raising agricultural productivity. In Finland shifting cultivation and deforestation were closed down primarily as market driven processes with necessary juristic infrastructure: increasing value of forest lowered the opportunity cost of forestry and increasing agricultural productivity provided sufficient food from a smaller area than during the shifting cultivation era (Palo 2004).

Reducing poverty by tropical forests and especially via the CDM of the Kyoto Protocol provides new options, but may be rather time consuming in order to safeguard expected results on any larger scale. Because then first corruption has to be reduced, land reforms carried out and a number of market supporting juristic and information infrastructure created. Implementation of such projects can provide labor income and with some use rights also some sales income, but the full arsenal of the market system, which has eradicated poverty in Finland in a national scale, is still missing in the tropics.

Without a continuous economic growth any major poverty reduction is not feasible. However, a delicate issue remains on 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…"

The countries in East Asia have promoted simultaneously growth and equity. Therefore, they provide illustrative cases of the effectiveness of this strategy (Stieglitz 2003).

History may not know any country, where a remarkable poverty reduction has taken place via a voluntary action by the elite class. The poor have to take the economic and political power in order to change the income distribution 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."

We defined the title of this paper as follows: "Poverty reduction by tropical forests?" It is now time to respond to this vital question.

Why has the Westobian theory (Westoby 1962) got empirical support in Finland and not in the tropics? It may be so, that the necessary implicit preconditions, such as closed access to forests, strong and clear private property rights and absence of corruption, 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 has supported both economic growth and sustainable forest management.

On the other hand, 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 advancing deforestation (Figure 1). When the value of the decreasing remaining tropical forests has not been increasing, no financial incentive for intensification of sustainable forest management has appeared. Additionally, too often the financial capitals have flowed abroad or to luxury goods by the elites benefiting from timber exploitations, instead of investments in domestic forest plantations or timber processing.

The FAO transited from export-led or import-substituting forest industrialization paradigm towards community and social forestry in the later part of the 1970s and in the 1980s, as did also the World Bank (Palo 1988). The mission of community and social forestry was to attack economic underdevelopment /poverty not through the top-down as in the Westobian approach but through the bottom-up strategy. So far, we have not seen any remarkable large-scale poverty reduction via community and social forestry. Why? May be no integrated theoretical framework supporting them 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 poverty reduction by forests. Action without guidance of 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, we believe, will stay as rhetoric as long as no integrated theory exists to indicate the operational steps to be followed.

‘Sustainable livelihoods approach combined with governance’ process as described by Hyden (1998) for the UNDP is one worthwhile candidate in this front. In fact, we have implicitly adopted an approach close to that in this paper. This recap is, however, strong: to advance stable and democratic governance. Such recap has earlier been considered as a radical engagement into the internal affairs of the national governments, if not even revolutionary. Hyden (1998) regards that supporting effective `governance` or changing the rules of the politics to favor the poor is a fitting approach for UNDP experts and consultants.

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

We may conclude here, that poverty reduction by the tropical forests remains rhetoric at least for some decades to come, if not a radical change in the strategies and their implementation will take place. We have indicated in this paper with empirical evidence, that decreasing forest area and increasing poverty are strongly correlated. Our scientific scenarios show a continuous decline of natural tropical forests at least until the 2020s (Figure 1). During the same time 29 – 44 percent of the 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 African tropical forests may be lost until the 2020s (Palo & Lehto 2003b). When most of the poor reside in tropical Africa and tropical Asia, these scenarios undermine seriously the ambitious goals of poverty reduction by the UN and its family members.

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

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? FAO, Bangkok.

Palo, M. & Lehto, E. 2000. Modeling tropical deforestation and carbon flux scenarios. *Proceedings/TF1 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.

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 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.